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CONTRACTOR DIESEL

ALTO®
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Wap
KEW
TECHNOLOGIES

Repair Manual

2003-11-14

125 03 47 (03.2003)

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Diesel

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Diesel motor RUGGERINI	MD 151, S
Engine type	4 stroke two cylinder
Max. output at 3600 rpm	13 HP / continuous 12.3 HP
Max. torque st 2400 rpm	3.26 Kgm
Fuel consumption	Approx. 3 l/h
Fuel tank capacity	4.1 l
Adjusted speed at max. pressure	3500±10 rpm
Cooling system	Forced air 700 m^3/h
Air requirement for combustion	62 m^3/h
PTO shaft rotation	clockwise
Max. vacuum intake	0.024 bar
Max. exhaust backpressure	0.039 bar
Engine oil capacity / type	1.8 l / SAE 15 - 50
Dry weight	50 kg

		Heavy Duty
Opening pressure	210 bar	225
Pump pressure	180 bar / 2550 psi	205
Nozzle pressure	170 bar / 2410 psi	195
By-pass pressure	8 bar	10
Water quantity at min./max. pressure	20/19 l/min.	17.5/16 l/min.
Water quantity at steam	9 l/min.	8 l/min.
Pump pressure at steam	40 bar	30 bar
High pressure nozzle	1506 = 1.35 mm	1505
Max. temperature of inlet water	35°C	35°C
Inlet pressure, max.	10 bar	10 bar
Chemical injector (external only)	03 injector / foam injector	
Density (control box)	IP45	
Engine r.p.m. (pump pressure)	1750 ± 25 r.p.m.	
Noise level according to ISO 3746	85 DB(A) from 7 m distance	
Type of piston	Stainless steel	Ceramic
Wobble disc no.	7	3
Type of oil	BP Bartran HV 100	

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		Heavy Duty
Boiler effect	115 kW	100
Water outlet temp. at max. water quantity (12°C)	95°C (205°F)	=
Oil consumption at max. water quantity and temp.	12 l/h	10 l/h
CO_2	10-12%	=
CO	50-100 ppm	=
Temp. flue gas at 20°C ambient temp.	160-200°C	=
Smoke scale number	Max. 1	=
Flue gas loss	Max. 10%	=
Oil nozzle type	9 kg/h - 60°S	=
Oil pressure	12 bar	11 bar
Boiler tube / measurements	Welded st. 35.8 / 20 x 3mm x 48m	
Heating surface	3 m^2	
Quantity of inlet air	Approx. 180 m^3/h	
Outlet flue gas	260 m^3/h at 200°C	
Tank capacity max./min. Jerry can	20 l / 3 l	

A1 KEW-steering	24V AC 642009A
A2 KEW-converter	12V DC / 24V AC 6420013
B1 Flow control	After pump magnet oper. Reed-switch
B2 Flow control	Before boiler magn. oper. Reed-switch
B4/B5 Temperature sensor	PT500
B6 Flame sensor	Light-sensitive transistor
B67 Motor oil switch	Open at a normal oil pressure
F1 Fuse on print A2	1 AT
F2 Fuse on print A2 *)	6.3 AT
F3 Fuse for PC-board A1 (see page 5)	1.25 AT
F4 Fuse for start protection (see page 5)	1.25 AT
G1 Accumulator battery	12V min. 50 AH (300 Amp.)
G2 Generator internal/external	12V - 15V - 280 Watt / 300 Watt
G3 Regulator/Rectifier	
H1 Motor oil alarm	Lamp on front
H2 Starting relay	Lamp on front
M1 Starting motor	1.1 kW
R1 Resistance (only where B5 is not used)	560 ohm
S1 Start switch	Key on front
T1 Ignition transformer	Prim: 2x12VAC/17 Amp. Sec. 11KV
Y1 Magnet valve for oil pump	24 VAC
F3 *) secure against fault polarization of battery	

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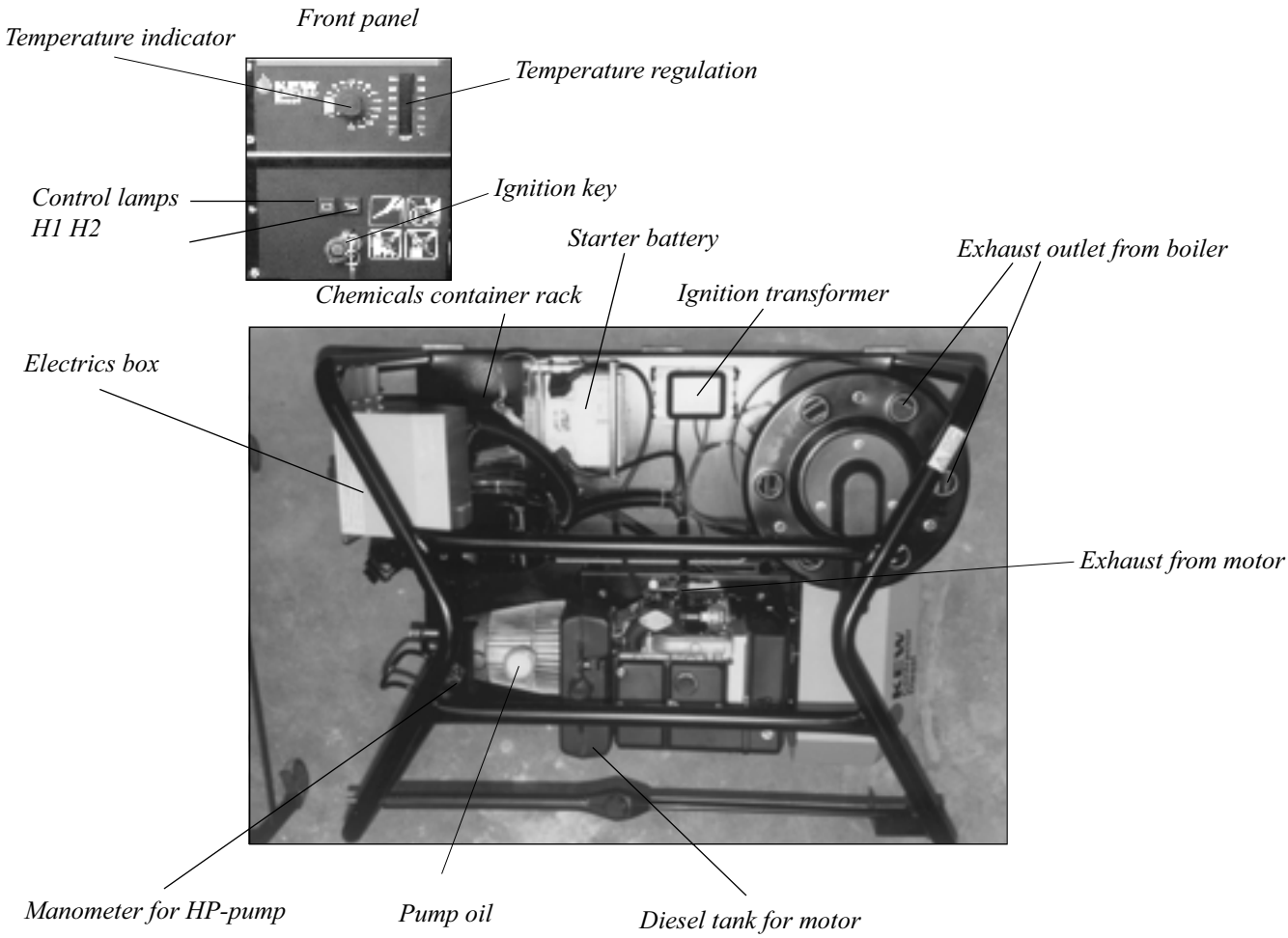
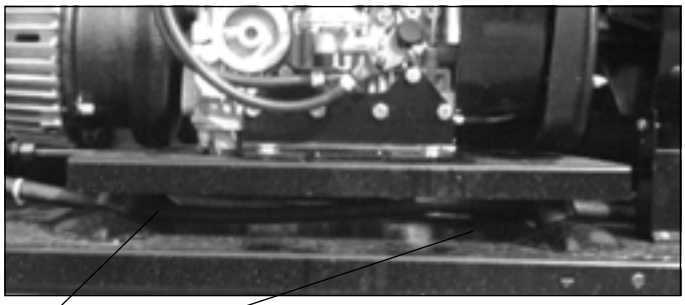
The Contractor is constructed on a combined pipe and plate frame, surface coated with a strong polyester. Each single item of the machine is placed in a way that an optimum weight distribution is obtained taking service and operation into consideration.

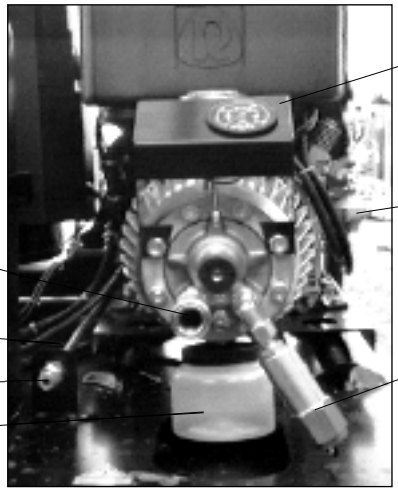


Back of electrics box



The base plate for the motor/pump unit is mounted on 4 inclined vibration absorbers.
The boiler is mounted on a plate construction, which serves as air duct from blower to boiler.
Electrics box is suspended in the pipe frame and contains the controlling and safety system of the machine

Pump front



Manometer

Water quantity regulation

Water inlet

Water outlet

Pressure outlet

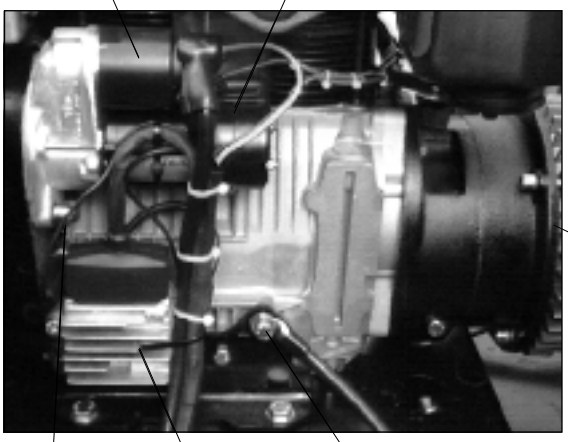
Sludge glass

Flow switch B1

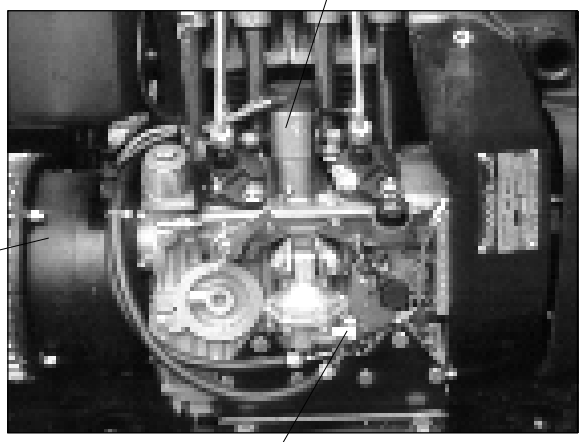
Electromagnet Y2 Y3 (safety stop)

Starter relay

Starting motor



Gearbox



Oil pressure switch B7

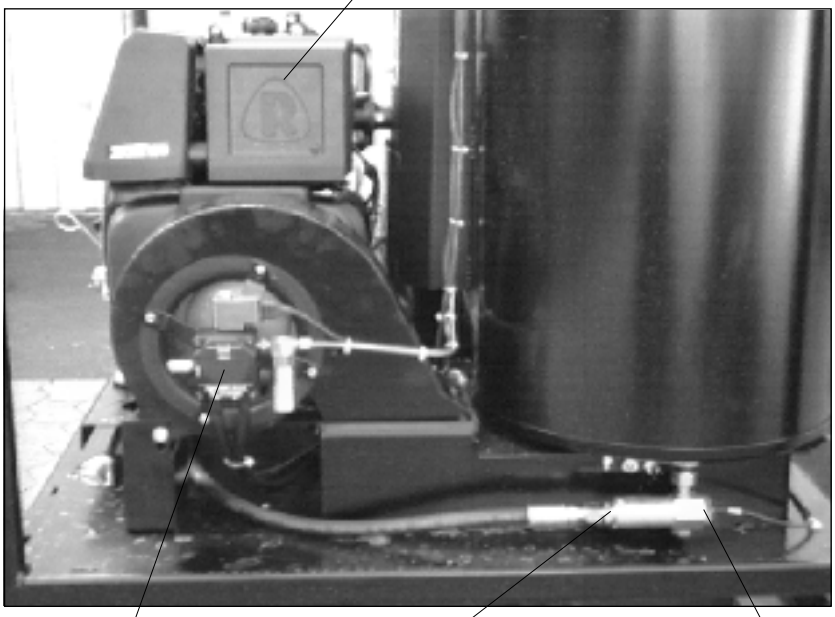
Rectifier G3

Motor connection (- pinch)

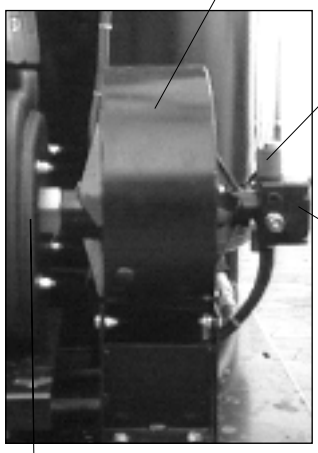
Diesel oil for pump

Motor air filter

Blower



Flow switch B2



Solenoid valve Y1

Flexible coupling

Fuel oil pump

Air adjustment screw

Flow switch B2

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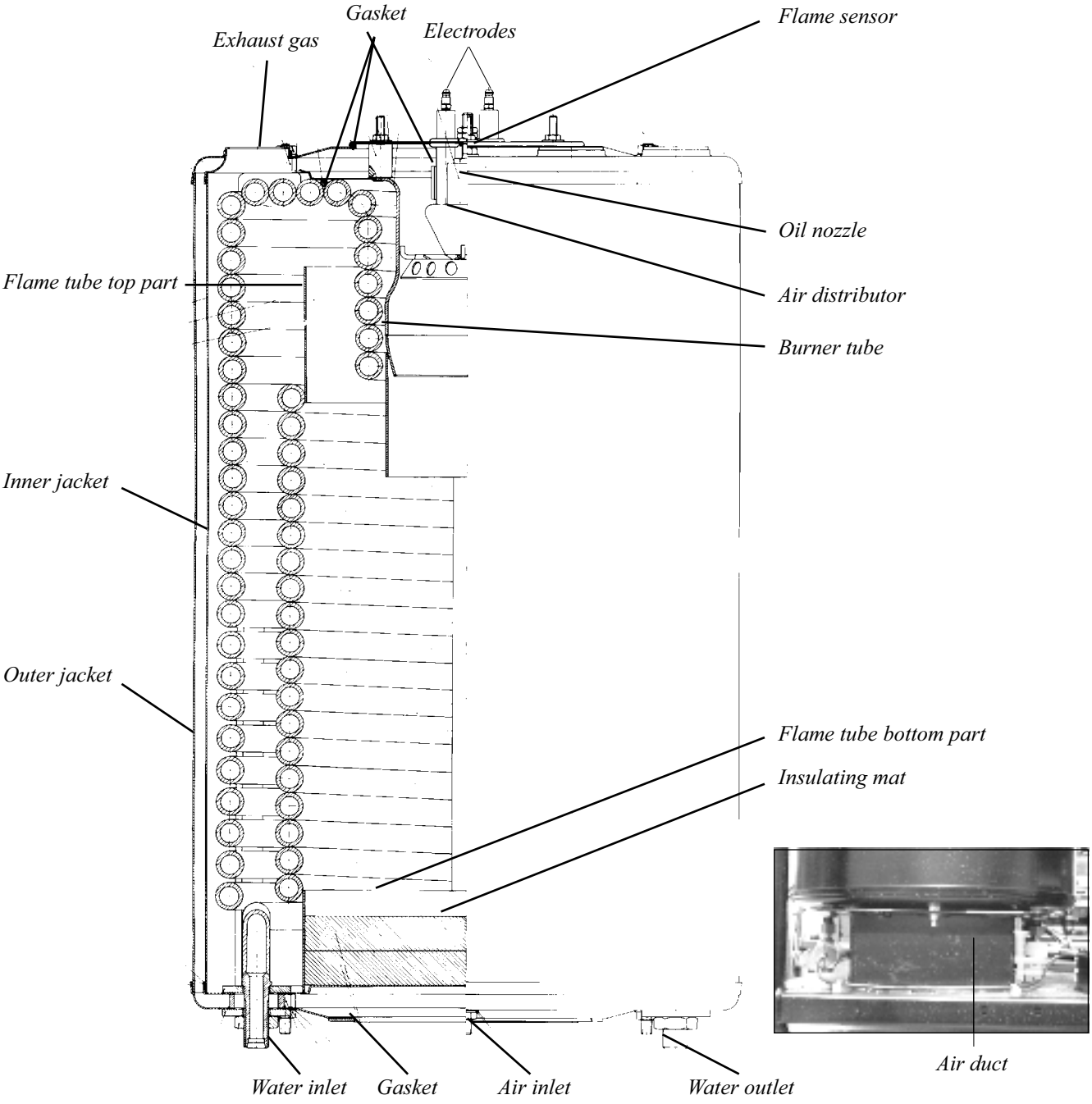
The boiler is the heat generating part of a hot water machine. It consists of a labyrinth-constructed tube coil, which encloses the combustion chamber.

The tube coil is enclosed by a double container with boilerjacket, bottom, and top in a sandwich construction, between which the combustion air is pressed into the combustion. An insulating material placed in the bottom of the boiler makes sure that the inner bottom, among other things, is protected from superheating.

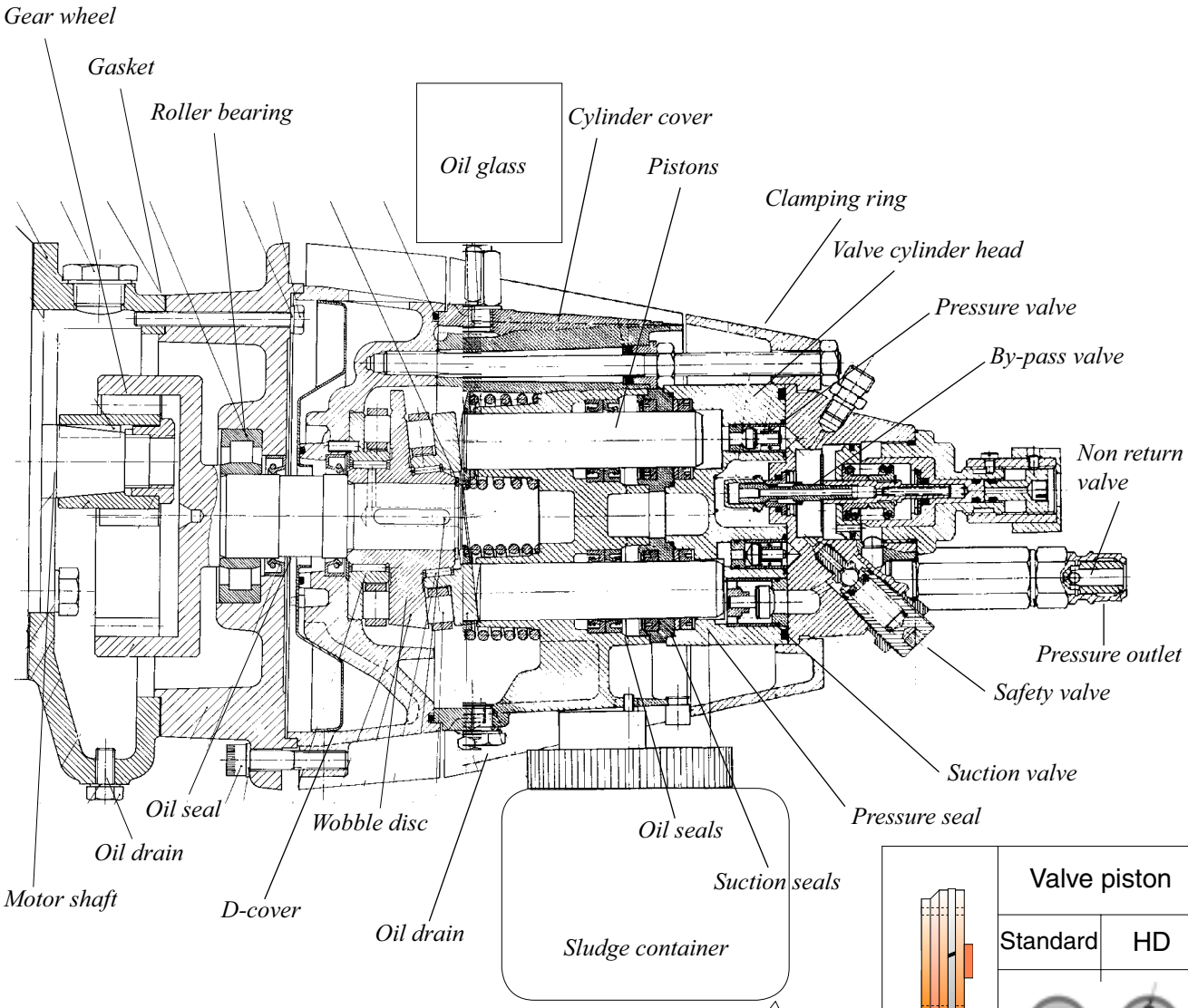


A flame tube consisting of two rings has the purpose of securing that the hot exhaust gases are forced round the labyrinth of tubes.

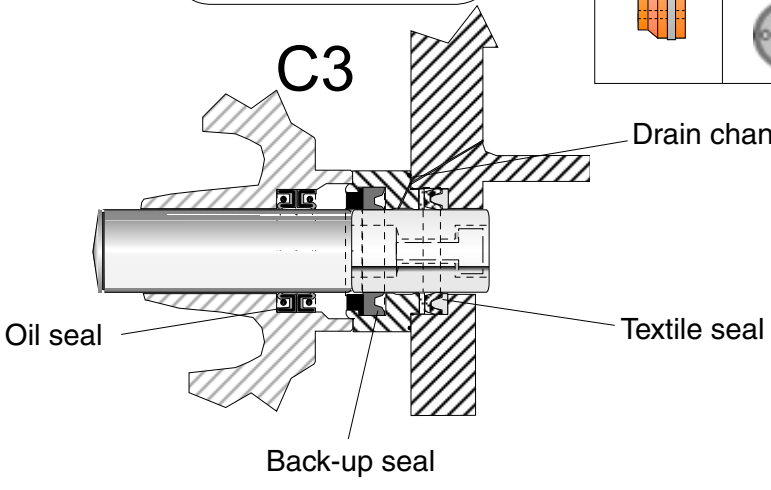
The boiler is mounted on the air duct with a gasket between and fastened with 3 bolts. In the air duct an adjustable throttle is mounted.

Pump

The pump is a 4 cyl. axial pump model 03 with standard sealing system and steel pistons, or model C3 with textile seals and and ceramic pistons.
The pump is driven by the motor through a gear, which reduces the number of revolutions of the spindle from 3500 rpm to 1750 rpm.



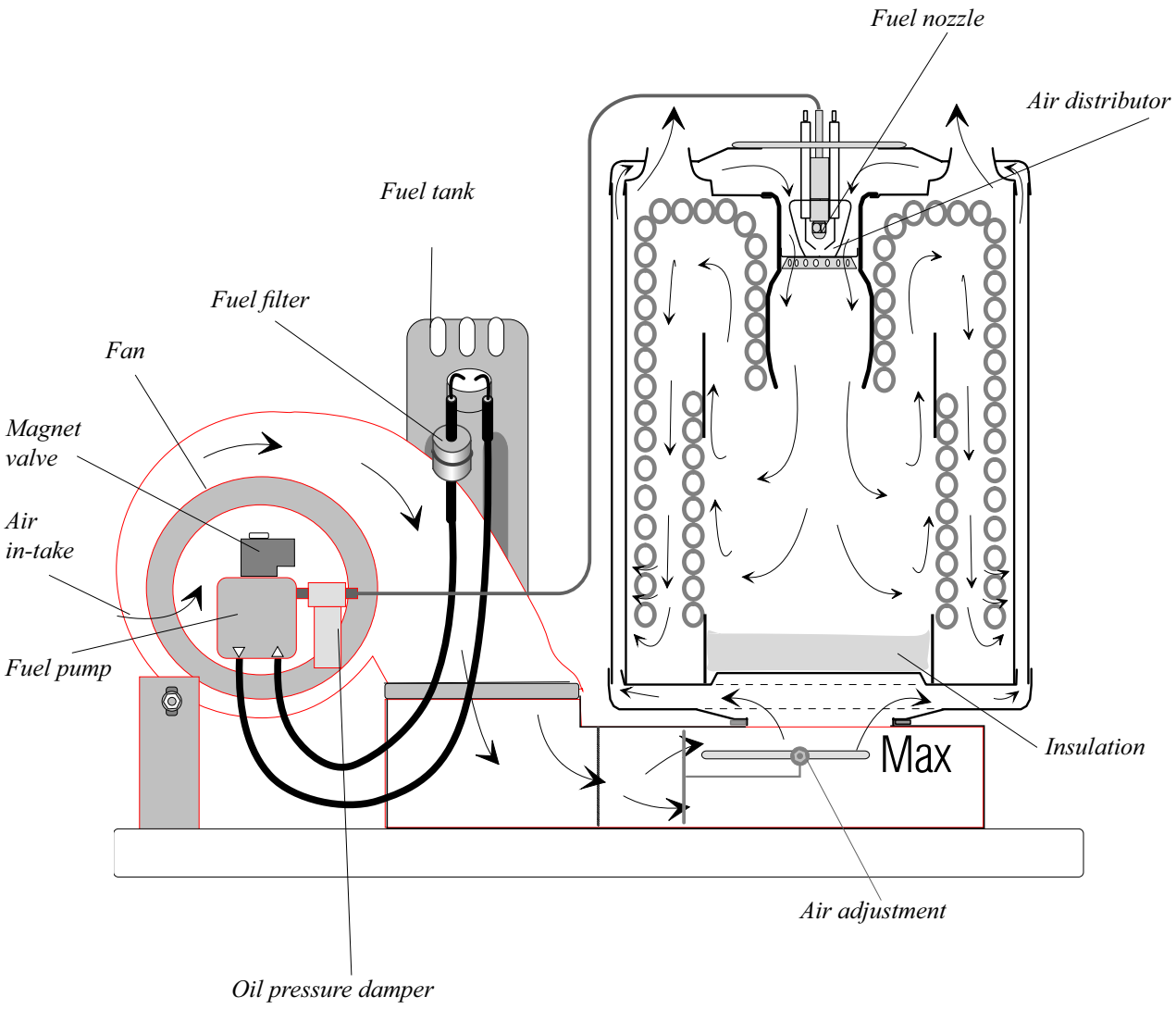
Valve piston	
Standard	HD



WOBBLE DISC	
Standard	HD
No. 7	No. 3

Operating diagram

When the Contractor is running, the fan draws in air and leads it through a channel with an air volume adjustment and into the bottom of the boiler, around and between the two jackets up to the air distributor. In this way the air is preheated, before it is mixed with the oil spray from the nozzle.



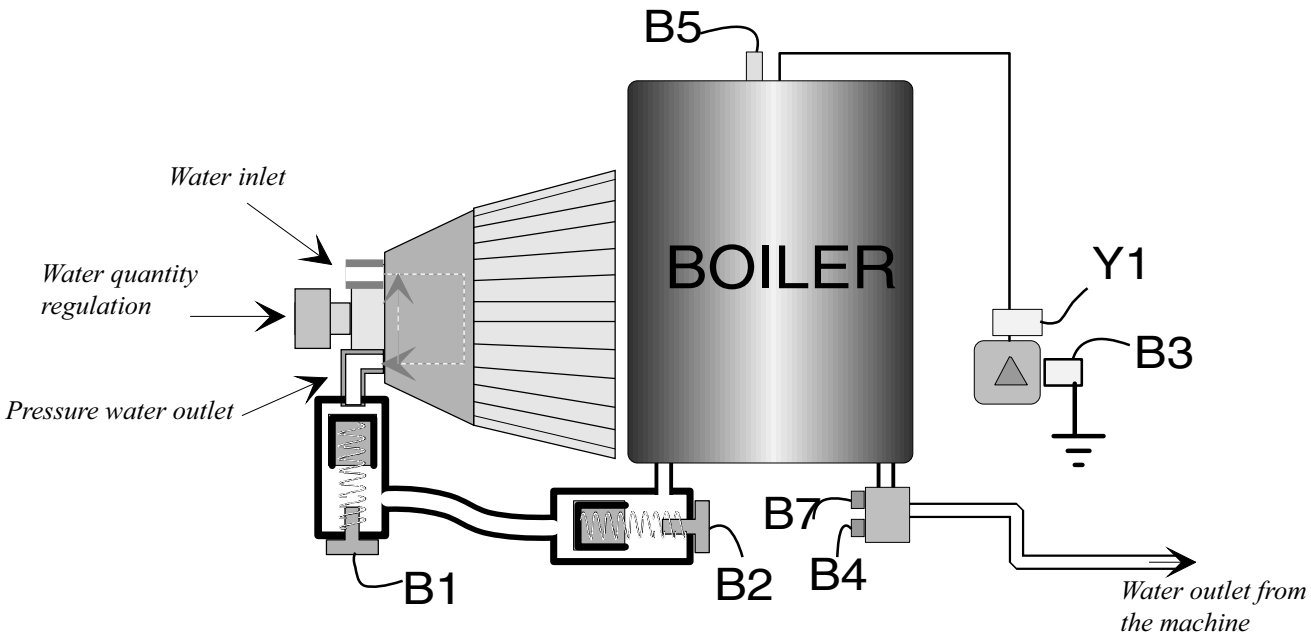
The fuel is drawn from the jerry can through the fuel filter to the pump, while in hot mode it is passed through the magnetic solenoid valve to the nozzle in the air distributor.

The ignition transformer is active for approx 6 sec., and during this period it will form sparks between the electrodes.
If the flame is not developed within this time, a flame sensor placed on top of the boiler will secure that the machine is automatically stopped.

When the machine is running normally, and the boiler is burning normally, the flame is pressed against the insulated bottom. The temperature is here approx. 1100°C. The hot exhaust gas is pressed further round the labyrinth-shaped combustion chamber, where the heat is absorbed by the water flow in the tubes.

Operating diagram

The flow system is simple with direct water inlet to the pump (water tank can be mounted), on which an adjusting screw permits infinitely variable regulation of the water quantity. From the pump the water passes two flow controls, before it flows through the approx. 30 m pipe line of the boiler. On the outlet pipe the temperature sensors are placed (2 sensors are mounted, where priming safety is necessary).



B1, B2 flow switch — The flow switch detects whether there is water and thereby a flow in the system. If one of the flow switches disconnects because of a failing flow, the oil supply will be shut off after 4 seconds.

B4, B7 temperature sensors — The temperature sensors are PT500 elements sensing the water temperature at the outlet of the boiler. The function of the sensors is, in a cooperation with the electronics, to check the outlet temperature of the water compared to the preset value, see also page 12.

B5 flame sensor — The flame sensor is a light-sensitive transistor mounted at top of the boiler. Its function is to detect whether the flame is on. If the burner does not ignite, the engine will stop within approximately 5-10 sec. In order to start the engine again, turn the ignition key in position „off“.

Y1 magnet valve — On the fuel oil pump the magnet valve Y1 is controlling the injection of oil into the boiler and by that the temperature. Y1 opens to the fuel oil, when B1 and B2 are activated at the same time, and the temperature setting is higher than the actual water temperature on the outlet from the boiler.

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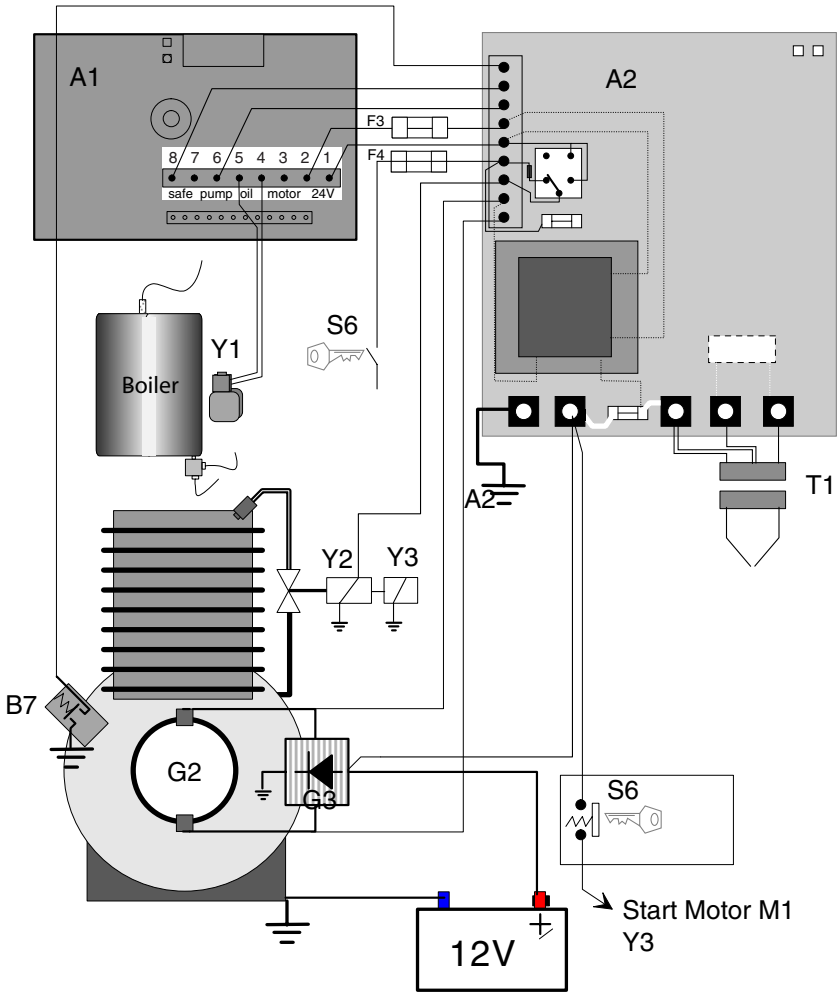
Operating diagram

Function **C**

The controlling and safety system of the Contractor consists of the PC-board A1, the main task of which it is to secure operation and safety of the boiler system. The PC-board A2 is a converter, the main tasks of which it is to convert 12 V DC to 24 V AC and to supply the ignition transformer with 2x12V AC.



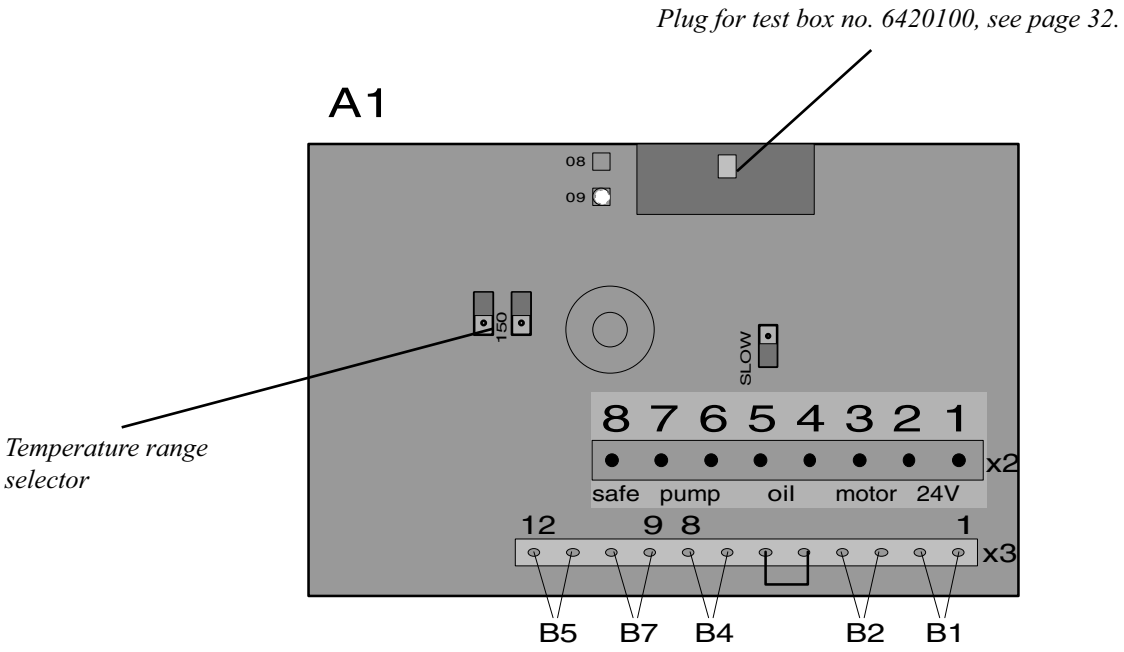
A1	KEW control
A2	12V DC/24V AC converter
B7	Motor oil switch
F1	Fuse 1AT
F2	Fuse 6.3A
F3	Fuse 1.25AT
F4	Fuse 10AT
G1	Accumulator 12V
G2	Generator
G3	Regulator / rectifier
H1	Oil Pressure indicator
H2	Charging indicator
M1	Starting motor
R1	Ohmic resistance
S6	Start switch
S1/2	12V DC from Accumulator
S3/4/5	2x12V AC to ignition trafo
JP1	9 Pole plug on A2
X2/3	8/12 Pole plug on A1
X4	Charging plug
T1	Ignition trafo
Y1	Solenoid valve fuel
Y2/Y3	Hold & Draw coil

When the motor is running, the generator G2 supplies 12 Volt DC to the converter A2, and the converter supplies 24 Volt DC to the control PC-board A1. The motor is automatically stopped at flame failure and at lack of lubricating oil in the motor.

F1	Fuse on A2	secures the PC-board against too big charging rate
F2	Fuse on A2	secures against wrong polarization of battery
F3	Fuse on El-box	secures A1 against overload
F4	Fuse on El-box	secures A2 against overload at starting of motor

B7 Motor oil alert

The motor oil alert is a pressure gauge mounted on the engine. Usually the pressure gauge is closed but at a normal oil pressure it will be open. If the engine runs dry of oil, the switch will close and thereby stop the engine.



The A1 PC-board is supplied with 24V AC from the converter PC-board A2, and it is controlling the oil injection (Y1) into the boiler with a 24V signal of X2, 4 and 5. This on/off signal is e.g. controlled by the flow controllers B1 and B2, which are each equipped with a Reed switch making contact when there is a flow through the machine.

If both flow controllers are not making contact at the same time (max. time difference approx. 4 sec.), the signal for oil injection (Y1) will disconnect and close, until the machine is stopped and restarted.

The temperature regulation is getting information from the temperature sensor B4 (PT500) placed in the outlet pipe from the boiler and from the adjustable potentiometer placed on the PC-board. The result is together with B1 and B2 controlling the signal for oil injection (Y1).

A safety thermostat (priming safety) B7 is securing that the machine stops, if the temperature of the boiler outlet pipe exceeds approx. 173°C. On some machines this additional safety is replaced by a built-in resistance.

The flame supervision circuit is connected to a light sensor B5 (X3.11 and X3.12) in the top of the boiler and stops the machine under the following conditions:

a) If a flame has not occured within 5-10 sec. after the thermostat output has closed.

b) If the flame disappears for more than 5-10 sec. while the thermostat output is closed.

c) If the flame is present 15-30 sec after the thermostat output has opened.

d) If a flame breaks out and stays for more than 15-30 sec. while the thermostat output is open.

e) If the light sensor is short-circuited or disconnected.

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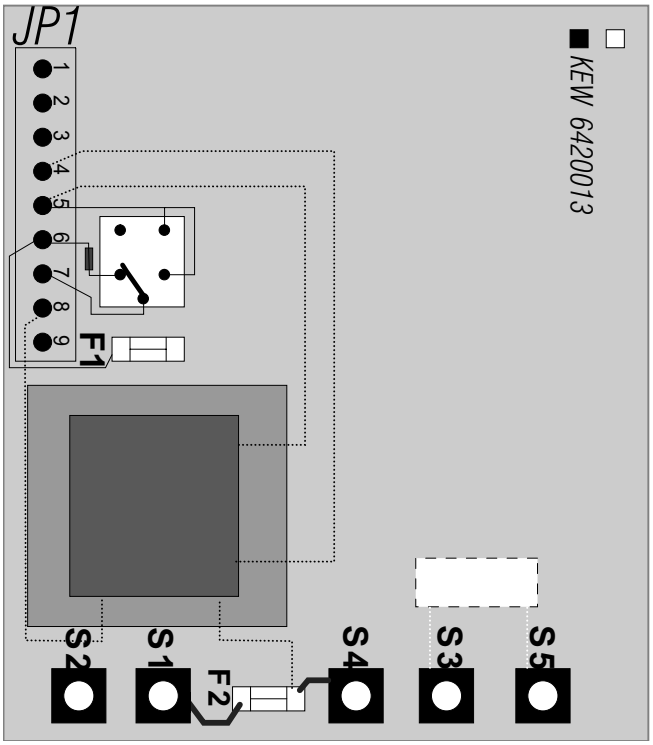


Starting rev., 24VAC:	2500 rpm ±10%
Declutching rev., 24VAC:	2300 rpm ±10%
Temperature range:	0-65°C
Securing of temperature - ignition transformer:	Interrupts at 90°C ±5°C

Connections:

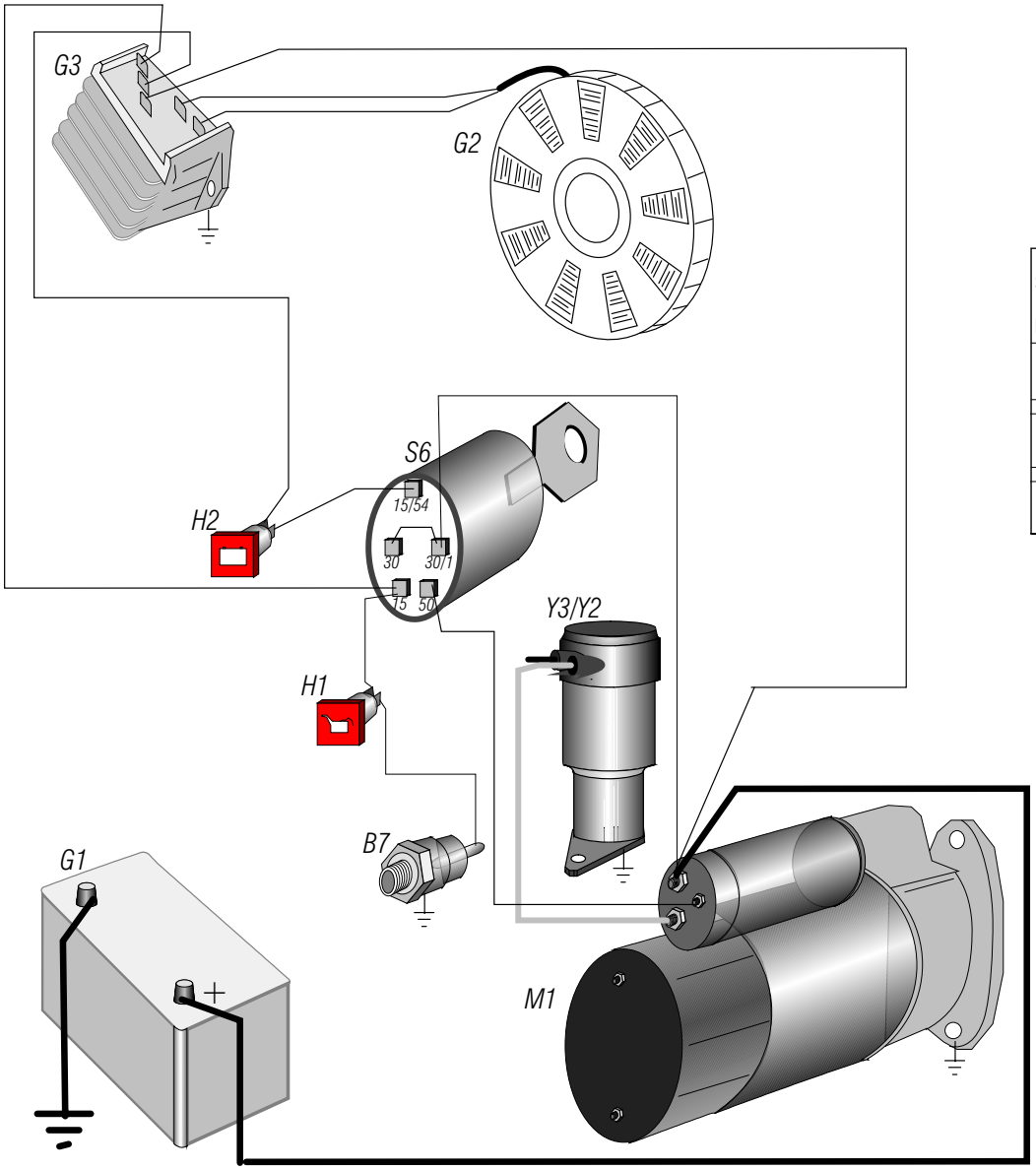
S1: +battery
S2: -battery
S3: ignition transformer
S4: double wire ignition transformer
S5: ignition transformer

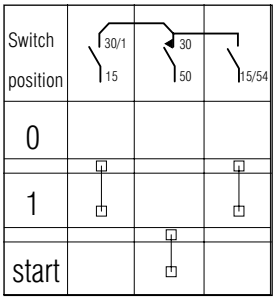
input from	1	Pressure switch B7
input from	2	Safe, X2-8 on 6420009
input from	3	Pump, X2-6 on 6420009
output to	4	24VAC (0), X2-2 on 6420009
output to	5	24VAC (f), X2-1 on
input from	6	Key, +12V from key
output to	7	Engine off, Y2 on engine
input from	8	G2 on engine
input from	9	G2 on engine

1. The converter is supplied with 12-15 VDC.
2. The converter supplies the control unit 6420009 with 24 VAC/55 Hz, when the engine is running (rpm > 2500).
3. The converter supplies the ignition transformer with 2x12VAC, when the engine is running (rpm > 2500) and there is a signal on „Pump“. The ignition transformer is active for approximately 6 sec. If new signal displays within the 6 sec., the time will start all over again.
4. The converter is protected against polarization errors, i.e. a fuse (F2) will blow if the cables of the battery are interchanged.
5. The engine is stopped by a signal at the Safe inlet. Disconnect the converter (Key off) before restarting the engine.
6. The engine is stopped by a signal at the inlet of the pressure gauge.
7. The converter features an excess temperature cut-out breaking the voltage for the ignition transformer at a temperature > 90°C.

Supply voltage:	12-15 VDC
Outlets:	
Supply for KEW 6420009:	24VAC ± 15% 0.5A 55Hz ± 15%
Voltage for the ignition transformer:	2x12VAC ± 15% 17A 100Hz ± 15%

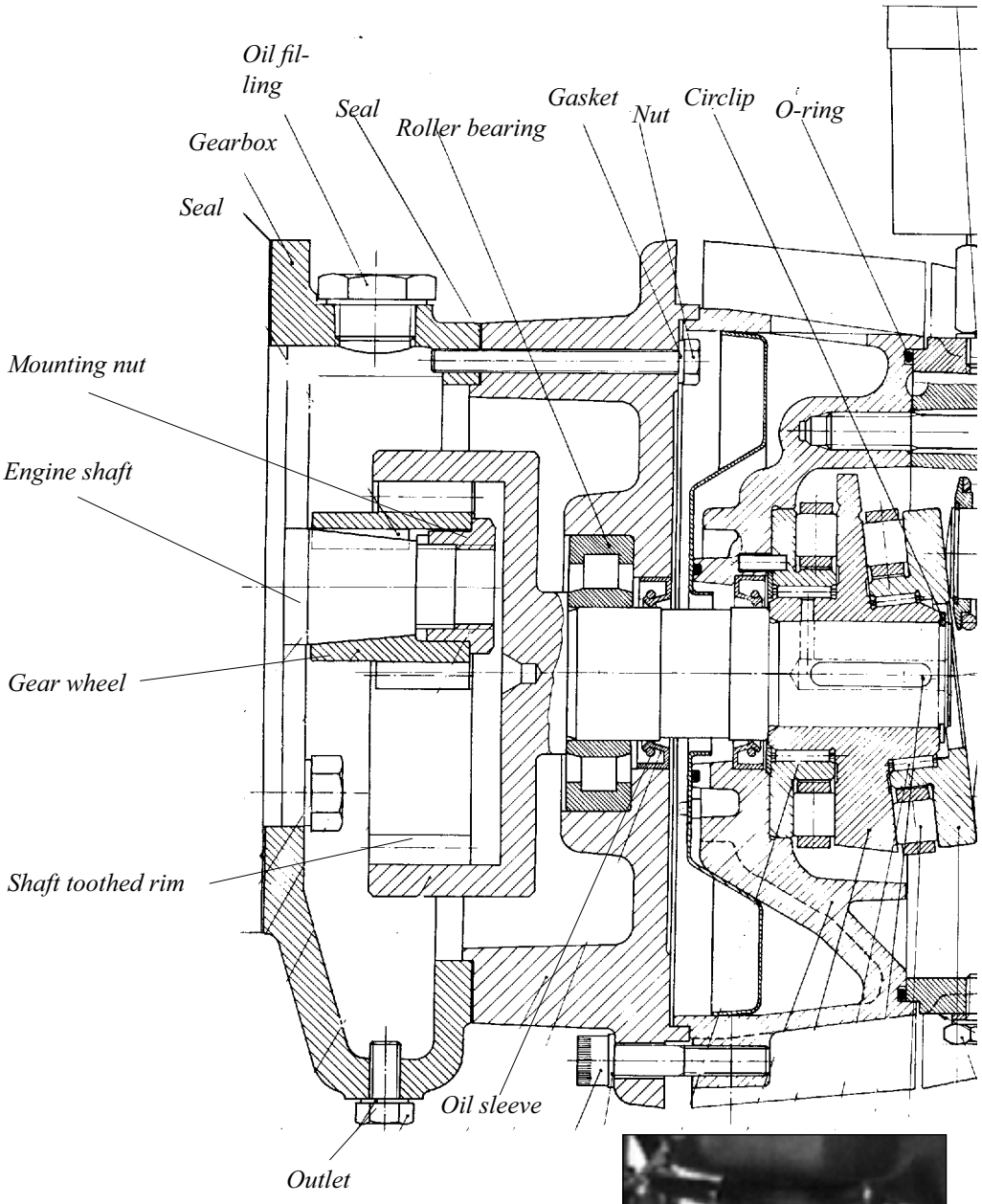
G1	12V start battery
G2	12V generator in motor
G3	charge rectifier
M1	start motor with relay
S6	start switch
Y3/Y2	pull hold coil for the fuel supply of motor
B7	lubricating oil pressure switch for motor
H1/H2	pilot lamps oil pressure and battery charger



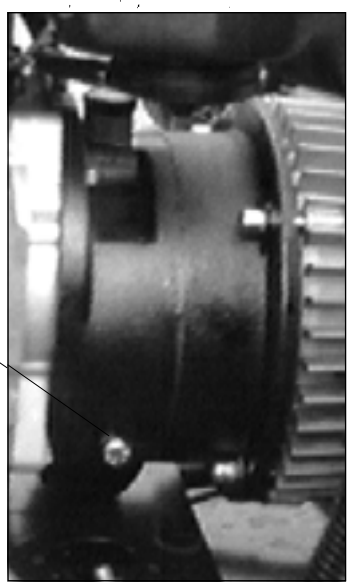


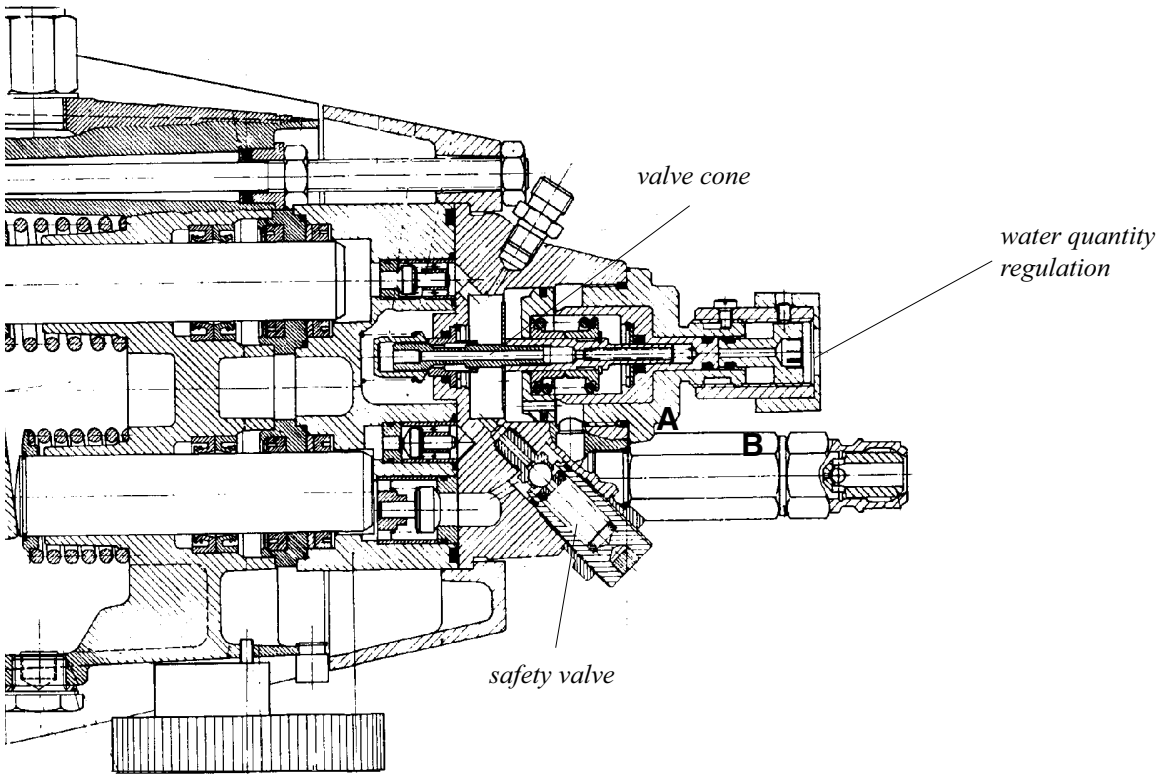
When the ignition key in starter switch S6 is turned into position 1, contact is made.
30/1 to 15 - by that H1 lights and contact is made.
30/1 to 15/54 - by that H2 lights.

When the ignition key is turned into position “start”, contact is made.
30/1 to 50 - by that starter relay and starting motor are activated. At the same time the draw coil Y3 is activated, which is thereby opening for the fuel to the motor. The motor accelerates, and oil pressure switch B7 opens. The oil lamp H1 is switched off. At approx. 2000 r.p.m. the generator G2 takes over the power supply and activates the charge rectifier G3. By that H2 is turned out.



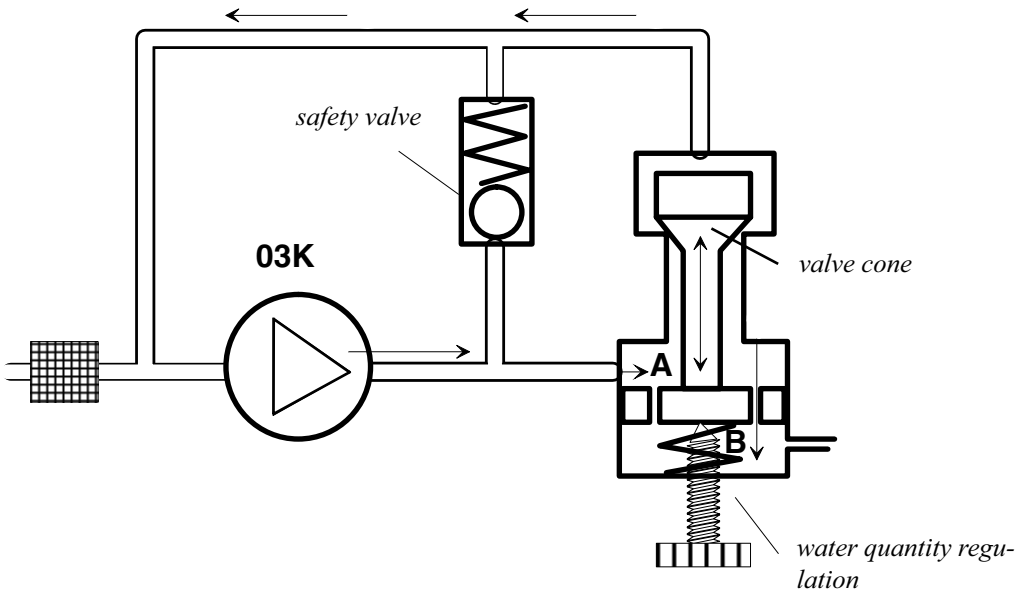
The engine shaft is mounted on a gear wheel, which through the inside gearing of the pump shaft is reducing the number of revolutions from 3000 to 1700 r.p.m.





The wobble disc is mounted directly on the gear shaft and yields at maximum pressure and water quantity approx. 1725 rpm. By doing so it delivers approx. 19 (16 *) l/min. through the suction valve, the pressure valve and the piston of the by-pass valve, where two through-holes make the necessary pressure drop to keep the valve cone closed.
When water flow is interrupted, pressure rises, until the safety valve opens. Because of the achieved pressure drop the valve cone is pressed to open, so that the water recirculates at a pressure < 10 bar.

Quantity of water is regulated by means of a screw pressing the cone to let some of the water recirculate.

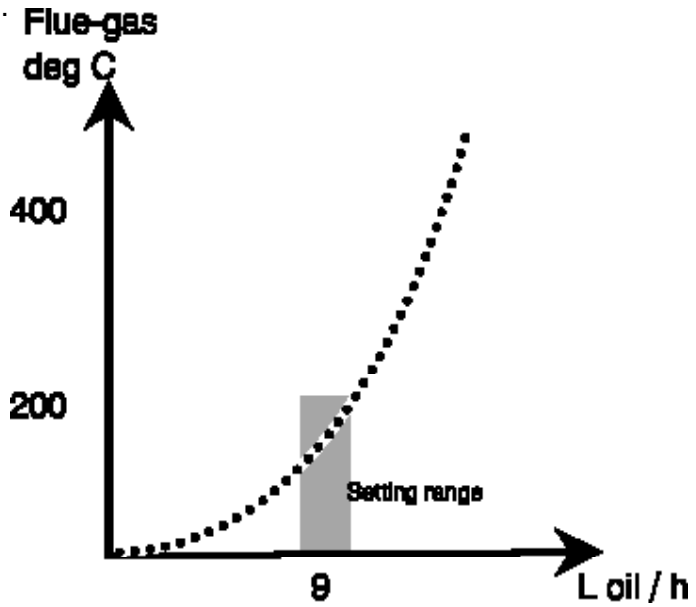


Combustion process

In the boiler the heating surface is approx. 2.1 m^2, i.e. the surface of the boiler tube, which receives heat from the buming oil.

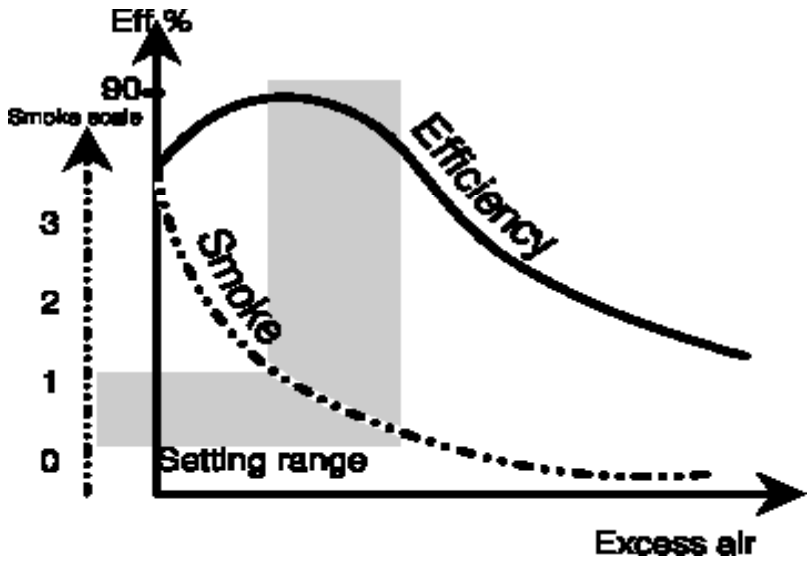
As only a certain quantity of heat can be transferred per m^2, when it is to be done in an efficient way, it means that the amount of oil which is pumped into the boiler, just as the quantity of air, must be accurately adjusted.

From the diagram below it clearly appears that the flue-gas temperature rises steeply, when the fired quantity of oil is increased.



If the temperature gets too low there is a risk of condensation formation, and soot coating. If the temperature gets too high the efficiency will fall, and the surface of the pipe is loaded disproportionately with damage as a result.

Conclusion:
The combustion process of the boiler is adjusted with 2 parameters, i.e. quantity of air and quantity of oil.
In order to get a general view of where you are in the adjustment, it is necessary to measure the flue-gas temperature and the CO_2 percentage in the flue gas.



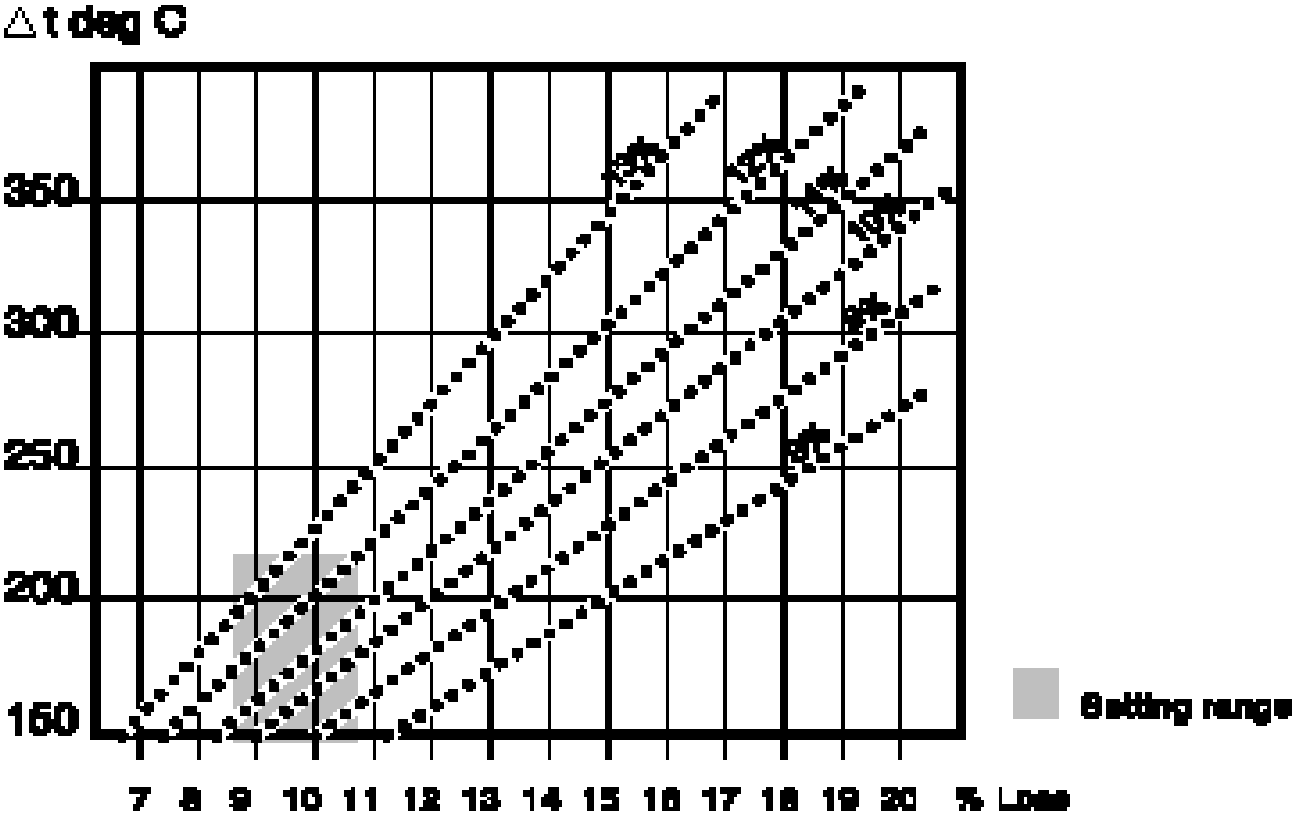
In order to obtain the best combustion with the lightest loss, the quantity of air supplied is to be as exact as possible.

Combustion process

Function C

The CO_2 percentage tells us how well the combustion has succeeded. As there is only 21% O_2 in the air, and the oil contains other things than pure carbon, it will be possible in practice to achieve a maximum of approx. 13% CO_2.

In order to find the best adjustment the below diagram can be used.



A complete combustion of oil can in its most simple form be written: C + O_2 > CO_2 + Q (=heat). C is pure carbon, O_2 oxygen, and CO_2 is the pure waste product carbon dioxide. The composition of the oil is considerably more complex, e.g. contains the oil besides carbon also sulphur S and hydrogen H. In addition to 21% oxygen O the air also contains nitrogen N_2, which by and large makes up for the rest of the content.

The combustion will consequently look like this:

— oil —	— air —	———— waste products ————
C + H_2 + S	+ O_2 + N_2	>> CO_2 + CO + H_2O + SO_2 + Q loss

Of harmful waste products CO is the most dangerous one, as very small concentrations may be deadly. CO is the result of an incomplete combustion, e.g. if there has not been sufficient air for the process. A more visible proof of this is sooting smoke.

H_2O is water in the shape of steam and is, of course, harmless, unless it condenses in the boiler.

SO_2 sulphur dioxide will not be unpleasant, until it has been futher converted into SO_3, and together with the steam in the flue gas form H_2SO_4 (sulphuric acid), which results in corrosion in the boiler elements when it condenses.

N_2 nitrogen passes unaffected through the boiler. Unfortunately, it gets heated up, and is in that way the most essential cause of flue-gas loss.

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Types of faults

Before the actual trouble-shooting is started, it is important to be sure that the interruption has not been caused by simple defects, which in most cases can be solved by the customer himself. Therefore, check the below points to begin with.

MOTOR-errors:

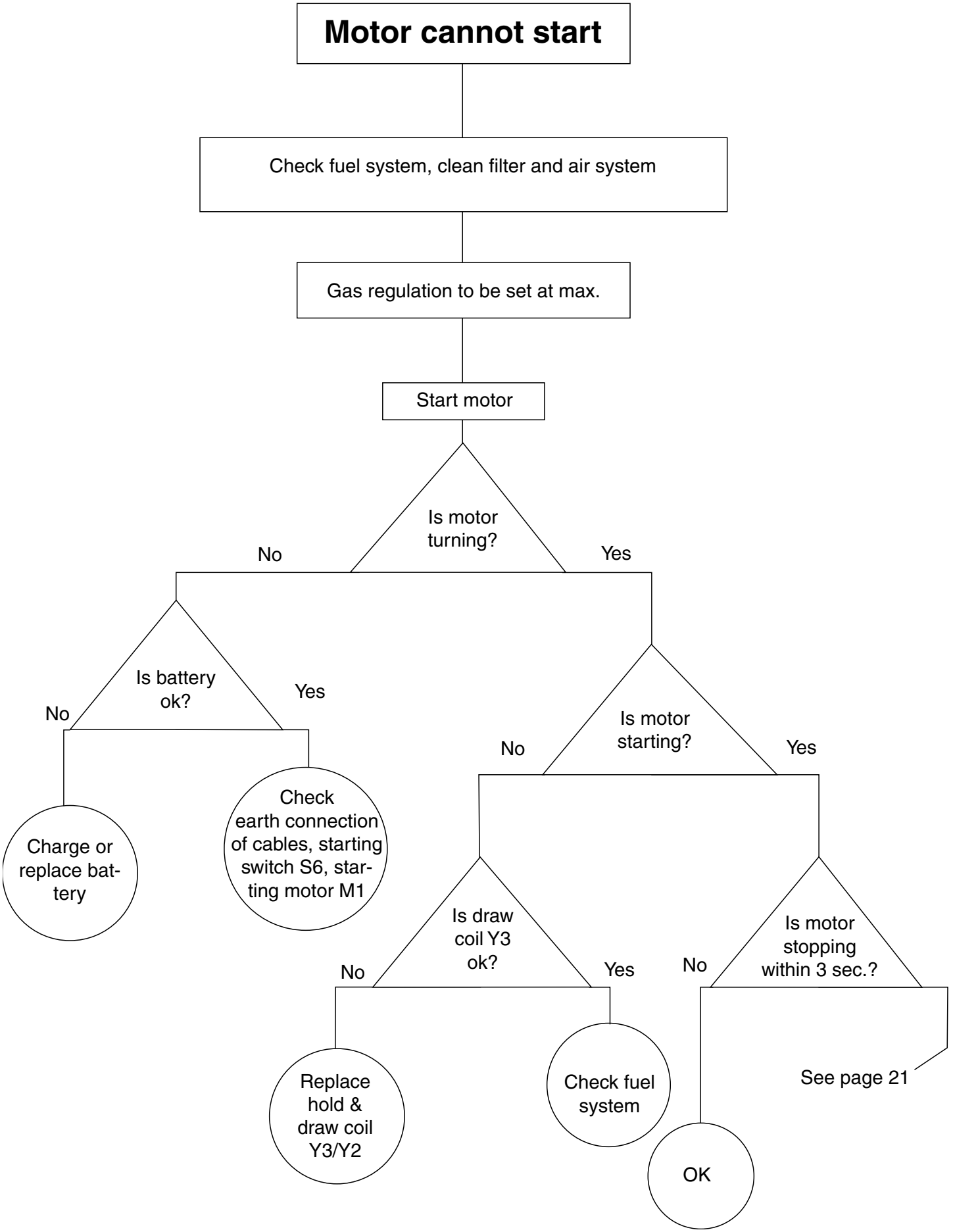
	OK
Battery voltage	☐
Diesel in tank	☐
Gas throttle open	☐
Diesel system free of air - thoroughly pumped	☐
Oil filter clean	☐
Lubricating oil in the motor	☐
Air filter clean	☐

PUMP-errors:

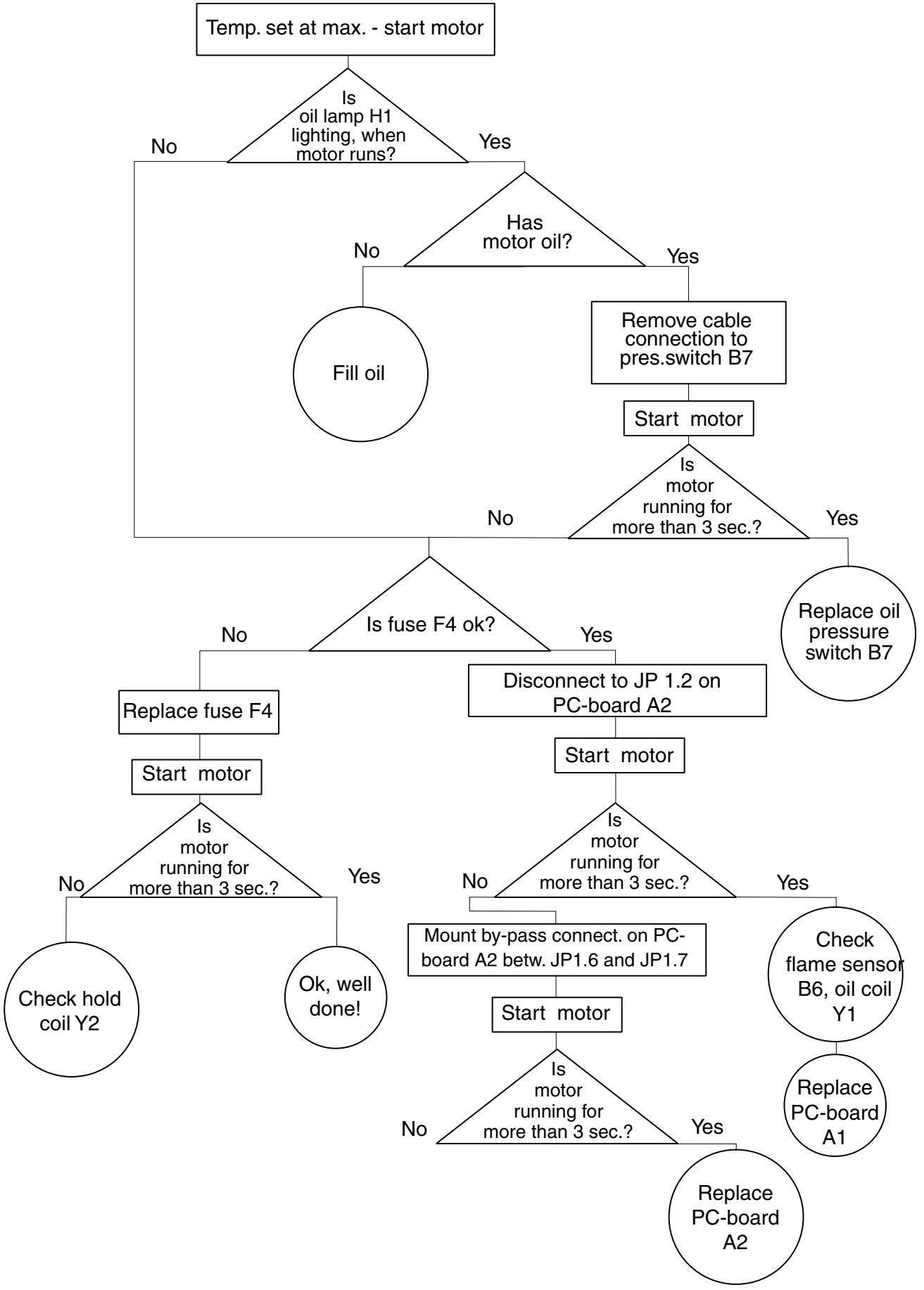
	OK
Water supply	☐
Water inlet filter	☐
Water temperature	☐
High pressure nozzle	☐
High pressure hose	☐
Boiler coil	☐

BOILER-errors:

	OK
Oil pump pressure	☐
Electrode spark	☐
Soot in boiler	☐
Air adjustment	☐
Fuel	☐
Fuel filter	☐


Motor cannot start
Check fuel system, clean filter and air system
Gas regulation to be set at max.
Start motor
Is motor turning?
No
Yes
Is battery ok?
No
Yes
Charge or replace battery
Check earth connection of cables, starting switch S6, starting motor M1
Is motor starting?
No
Yes
Is draw coil Y3 ok?
No
Yes
Is motor stopping within 3 sec.?
No
Replace hold & draw coil Y3/Y2
Check fuel system
See page 21
OK

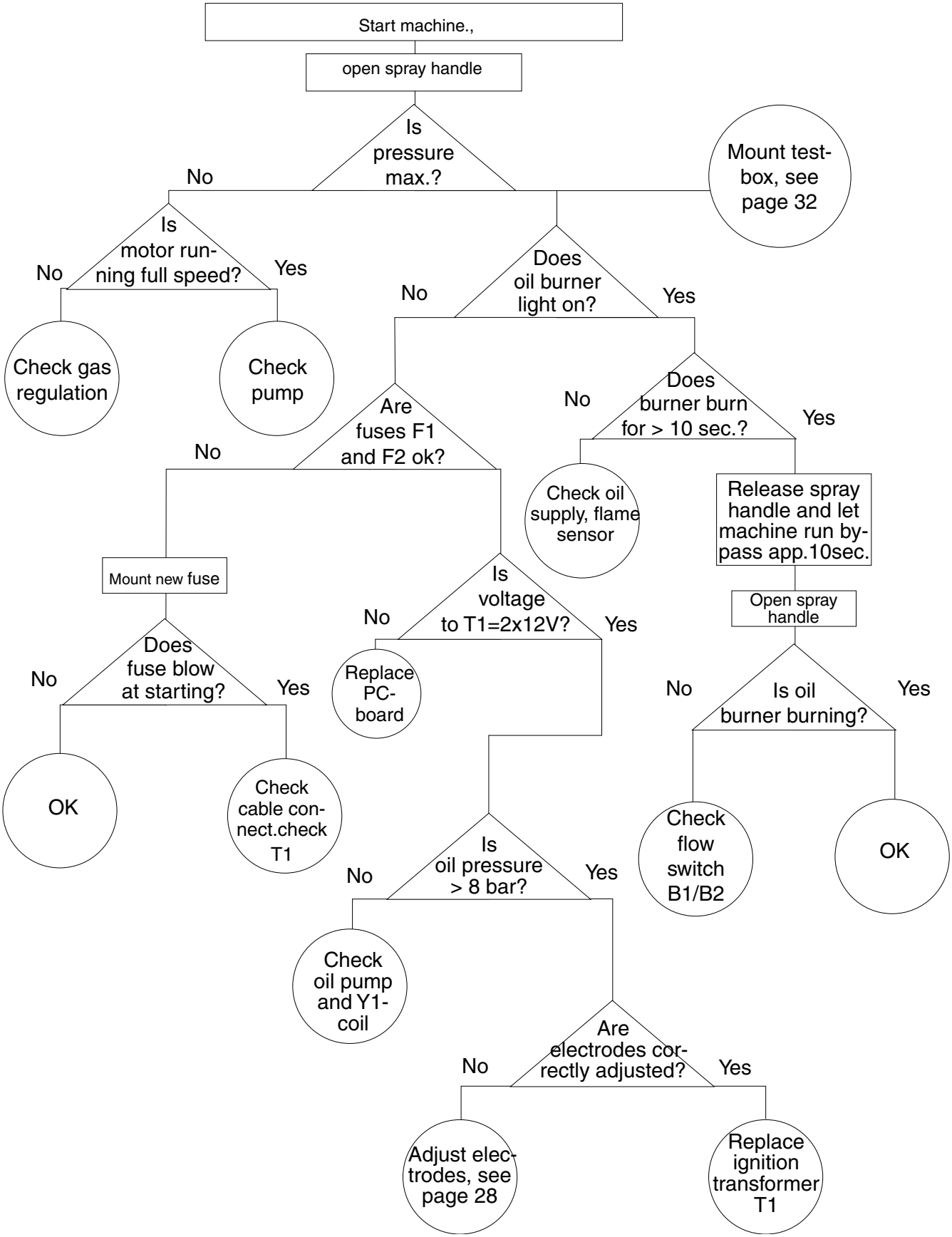
Motor is stopping approx. 3 sec. after start



Boiler does not burn / puts out

With HP-nozzle of the mach. mounted etc.,

see page 22 in manual



Performance faults

The symptom is reduced performance of the pump effect or the boiler effect.

The symptom of reduced boiler effect is a lower water outlet temperature than the set value. The possible causes for this are as follows:

Scale deposits in boiler tube:
Scale formation acts as insulation and reduces heat transfer to the water. The result is raised flue gas temperature = increased flue gas loss.

Cause 1: The hardness of the water
Remedy: Descale boiler tube.

Sooted boiler tube:
Soot has the same effect as scale deposits, i.e. that they are both insulating against the heat transfer to the water and results in increased flue gas temperature = increased flue gas loss. Other symptoms are that the machine smokes during operation.

Cause 1: Air deficiency.
Remedy: Check air adjustment and fan tightening to boiler.

Cause 2: Bad oil/air mixture.
Remedy: Check oil pressure and oil quality. Replace the oil nozzle. Adjust air diffuser.

Cause 3: Unfinished combustion.
Remedy: Check bottom insulation, boiler top gasket between tube and inner boiler jacket in top cover. Check burner tube.

Cause 4: Unstable ignition.
Remedy: Check electrodes. Adjust the air quantity (less air).

Cause 5: Leaky solenoid valve on pump. Y1.
Remedy: Check/replace solenoid valve Y1.

Low oil pressure:

Cause 1: Incorrect adjustment.
Remedy: Adjust pump pressure, max. 11 bar.

Cause 2: Filter blocked, defective pump.
Remedy: Replace filter/pump. Empty and clean tank.

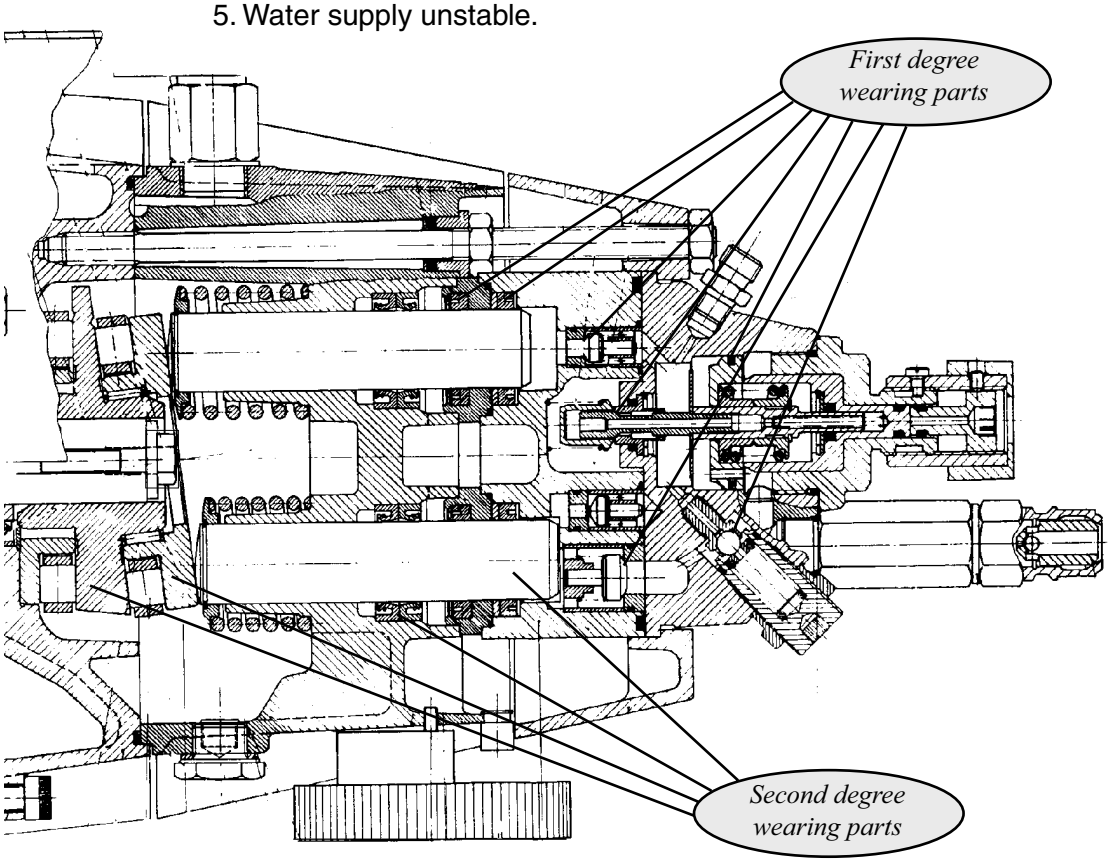
Full water quantity at steam stage:

Cause 1: Mechanical defect of by-pass valve or adjustment.
Remedy: Check by-pass valve.

Pump pressure

When the pump is failing, the reason might be found in one of the following categories:

1. Motor is running too slowly.
2. Pump parts are worn.
3. Dirt in valves or nozzle.
4. By-pass valve incorrectly adjusted.
5. Water supply unstable.



These 5 fault-categories have 3 different symptoms, A-B-C:

A: Pressure lies down to 50 bar under normal level, but even and without vibrations or bumping movements.

Cause 1:	Motor running too slowly	Check motor
Cause 2:	Leak from pressure side	Check wearing parts
Cause 3:	Water regulation not correctly adjusted or it sticks.	

B: Pressure lies down to 50 bar under normal level, but with clear vibrations in hose and spray handle.

Cause 1:	Dirt or wear has damaged the pressure or suction valve.
Cause 2:	Water supply insufficient or too hot.

C: Pressure falls down to 100 bar under normal level or goes up and down in a regular rhythm.

Cause 1:	Safety valve defect or not correctly adjusted.
Cause 2:	The high pressure nozzle choked or calcified.
Cause 3:	Non-return valve in pressure outlet sticks or has been turned wrongly.
Cause 4:	Coil in boiler calcified.
Cause 5:	Extension hoses too long or have too many joints.

Besides, see 03-service manual.

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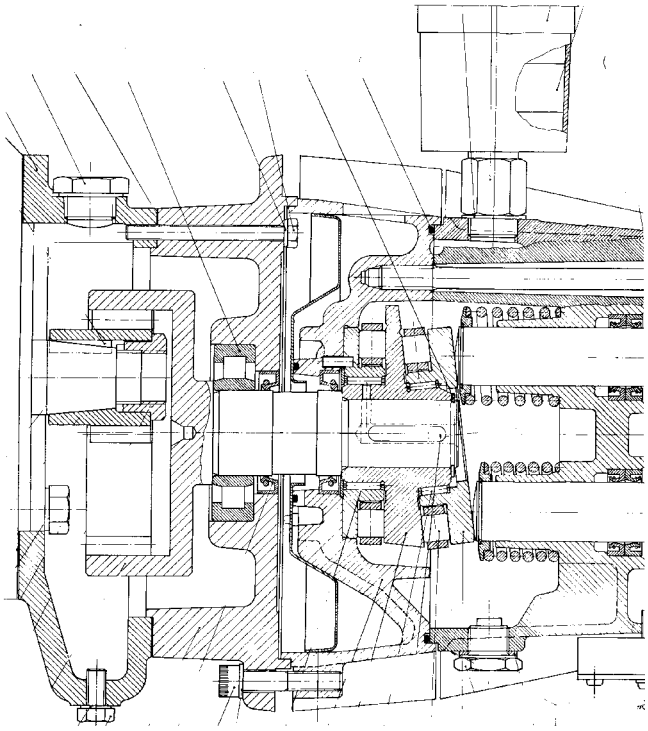
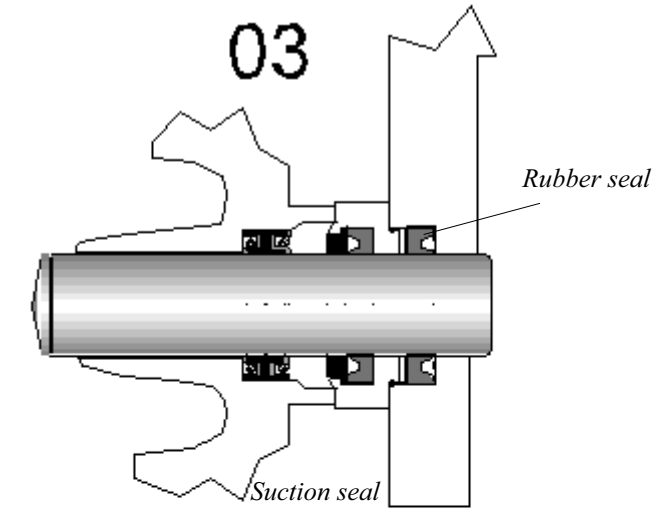
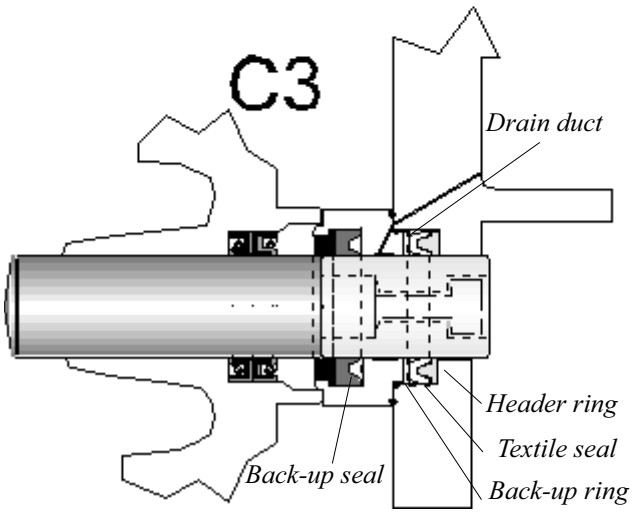
Mounting of the pump onto the motor differs from other 03-models at e.g. mounting plate, seal ring and O-ring on the motor shaft. On the wobble disc the inner needle bearing has been left out.
As to servicing of the pump please see the 03-service manual.

Gear to be mounted with torque wrench setting as stated.

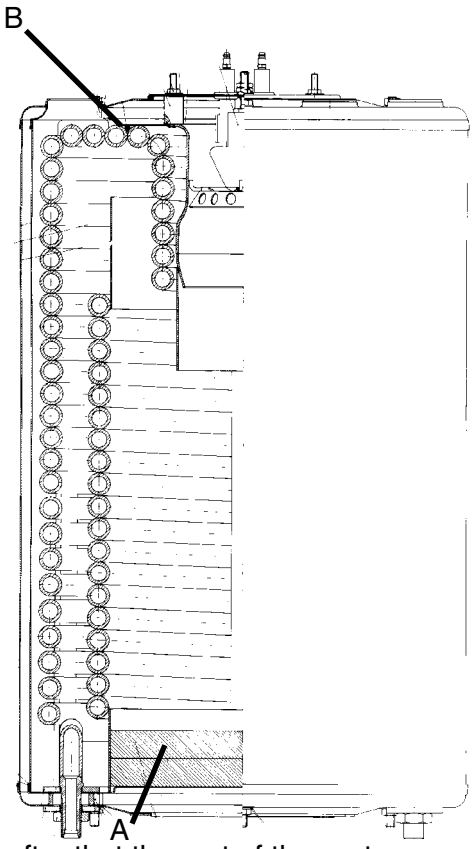


Gear to be filled with 0.3 l Castrol alphasynt 150. Possibly check by loosening level screw on inside of gear box.





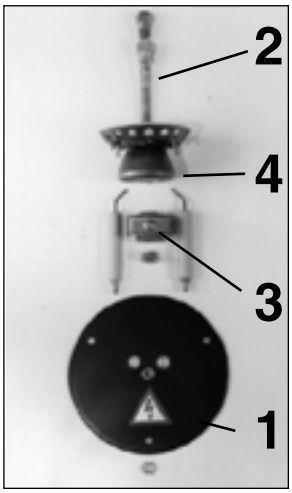
Mounting of textile seals by means of special tools no. 1220090. To be pressed by hand.

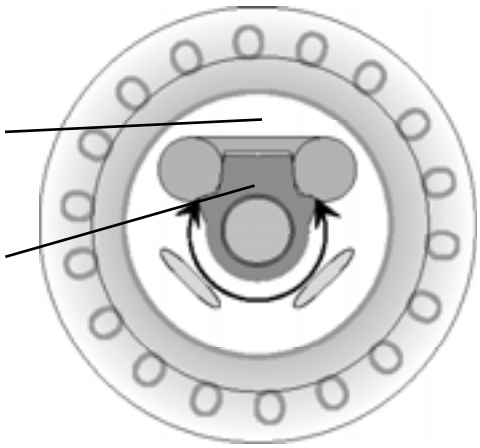


The boiler and its equipment are of the same type as 02V and 03V. Therefore, we refer to the 02/03V-service manual. We here only mention the most important subjects.

The boiler is at regular intervals (depending on the conditions) to clean and adjust. At cleaning the whole boiler is stripped, and the tubes are high pressure cleaned. At remounting it is important that the insulating cover at the bottom and the ceramic seal at the top are renewed.

At replacing the fuel nozzle at first dismantle the electrodes and after that the rest of the parts numerically as shown.





At assembling it is important that the mounting block (3) is placed in relation to the opening of the air distributor (4) and fixed, before the electrodes are inserted. This to avoid that the porcelain of the electrodes is stressed at tightening.
The electrodes are easy to adjust by means of the electrode adjusting tool, no. 1220125, see Technical Information no. 84 and page 28.

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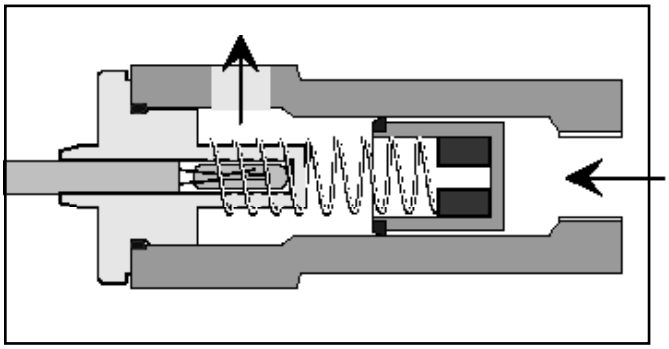
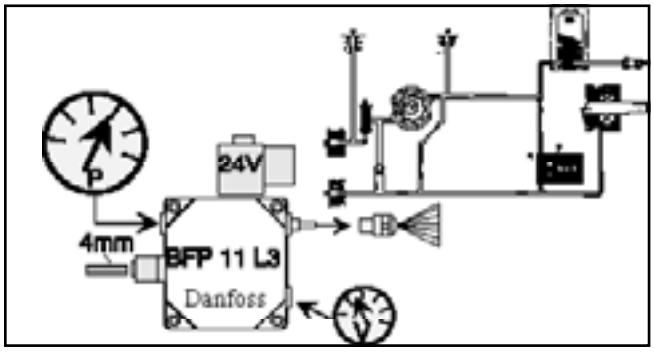
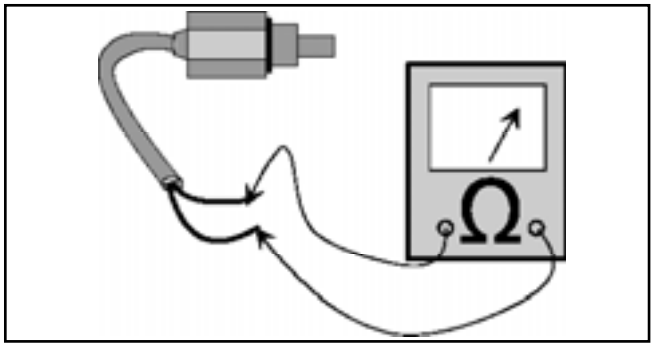
Sensors



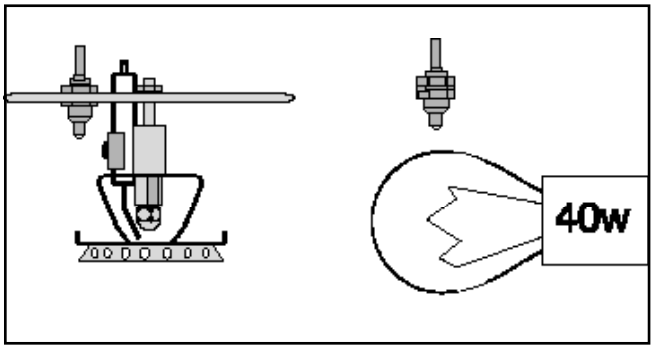
B1 and B2, flow switches, are functionally identical. At inspection it should especially be checked that the magnet is intact and without coating, that the Reed-switch is reacting regularly and that the piston is moving easily. The switch is normally closed.



Pressure of the oil pump is adjusted by means of a 4 mm Hexagon Key at approx. 11 bar, which are measured with a pressure meter. Filter of the pump is accessible by loosening 4 screws in the front cover.

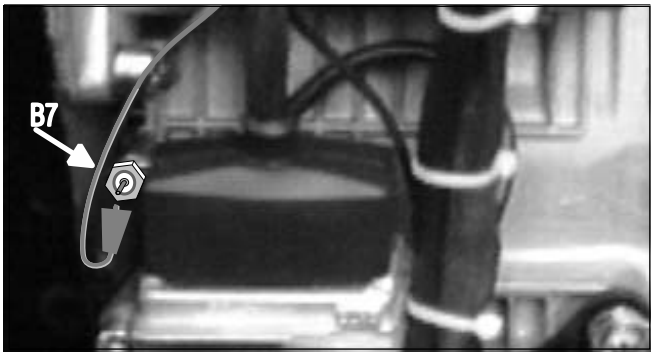


B4 and B5, temperature sensor type PT500, is checked by means of an ohmmeter. Within the temperature field 10°C - 25°C resp. 520 - 548 Ω are measured, and at 100°C approx. 692.5 Ω.

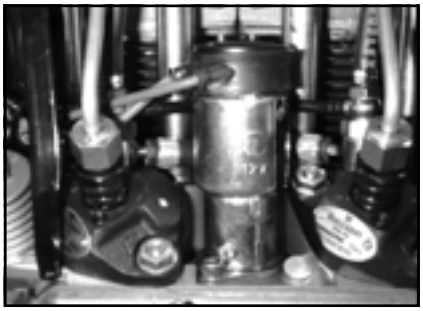


B6 Flame sensor. Could possibly be checked by means of an instrument with sound indication, indicating when actuated by a light from e.g. a 40W bulb.
NB: The sensor is polarized and must therefore be tested afterwards.

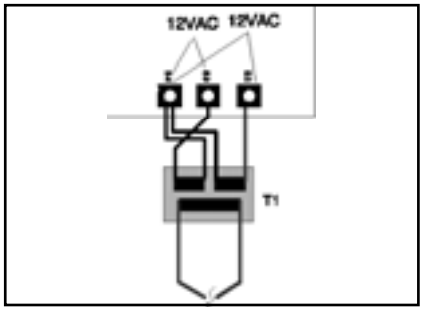
B7 is a pressure switch placed in the oil lubricating



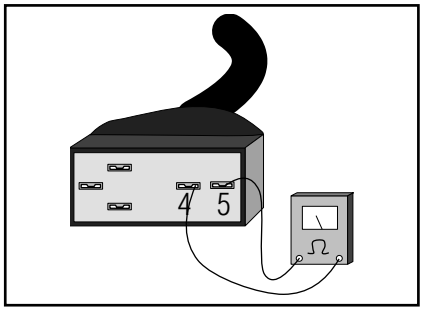
system of the motor. The switch opens, when the motor is turned with the starter. To measure by means of an ohmmeter by disconnecting A3 and measure between frame and free cable.



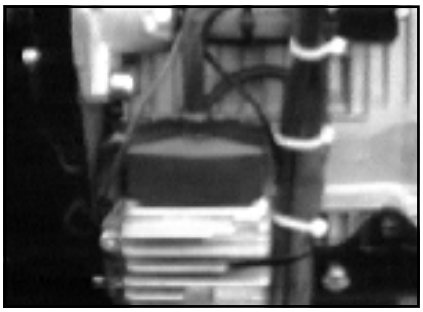
Y2/Y3 Draw and hold coil



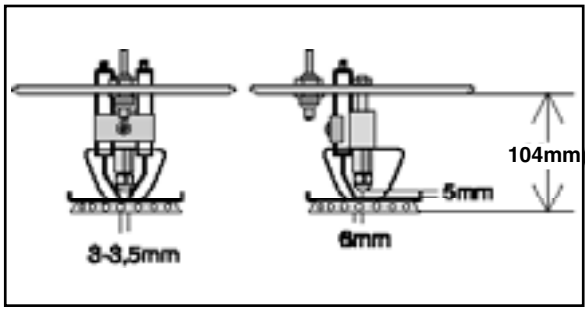
T1, Ignition transformer, primary voltage 2x12V, 16 Amp., secondary 11 kV. At testing turn the key to pos. 1. For 6 sec. the spark must jump between the electrodes. Possibly use an external air distributor for testing.



G2, Generator on motor. With the motor running check that battery G1 can be disconnected, without the motor falling out.
With the machine stopped measure with an ohmmeter the resistance between 4 and 5 (resistance must be 0). With max. rotations is measured between 4 and 5, 25-28V.



At max. number of revolutions the charging rate is checked, by disconnecting ÷pole to battery and measuring the current 0-10 amp. between pole and battery.



Air distributor to be adjusted as shown, approx. 3 mm between electrode pins, 5 mm from nozzle to electrode tip, and 6 mm from center of nozzle to electrode tip.

The nozzle: 10.26 kg/h 60° S

500 hours operation

It is recommended that the overhold is done according to the following points:

1. Control of water filter. Possibly cleaning/replacement.
2. Machine to be tested: Control of pressure, tightness and operation of oil burner.
3. High pressure pump to be stripped. Seals, valves, by-pass valve parts to be controlled/replaced. Pump to be assembled with new O-rings. Change of oil.
4. Remove air distributor and check oil nozzle, electrodes, ignition covers, possibly replace or adjust. Fuel filter to be cleaned/replaced.
5. Coil to be checked for soot coating, to be cleaned if necessary. Insulation on bottom and cord to be replaced.
6. Flow switches to be stripped and cleaned.
7. All hose connections and electric connections to be controlled/tightened up.
8. Machine to be tested with testing equipment and adjusted (water quantity, opening pressure, oil pressure, air quantity).
9. Various equipment to be tested, possibly repaired.
10. Final testing with various equipment.

1000 hours operation

Bearings, pistons, oil sleeves are checked.

Make sure that motor and pump contain oil and that filters are clean

1. Connect water supply (suction) and high pressure hose.
2. Temperature selector to be set at „cold“.
3. Start and let the machine run for 2 minutes with full water flow and without nozzle.

Check A:
- that the machine is running noiseless
- that the exhaust system is tight

4. Mount 06 or (05 on Heavy Duty) high pressure nozzle.
5. Set water quantity regulation at „max.“.

Check B:
- that water quantity is 19 l/min./(16 l/min. on Heavy Duty)
- that pump pressure is 180 bar or 205 bar on Heavy Duty (measured with the pressure meter of the pump)
- that motor speed is approx. 3000 rpm.
- that components and pipelines in the fuel and high pressure system are tight.

6. Mount test pressure meter on the outlet, and close slowly to the opening pressure (max. 210/ 225 bar).

Check C:
- that the safety valve opens at 210 bar (measured with the test pressure meter.

7. Water quantity regulation to be set at the minimum with 06-nozzle (05 on Heavy Duty) mounted.

Check D:
- that pressure measured with the pressure meter of the pump shows 25-30 bar.
- that the pump is coupling to by-pass pressure (8-10 bar), when the handle is released, and that it is quickly recoupling, when the handle is activated.

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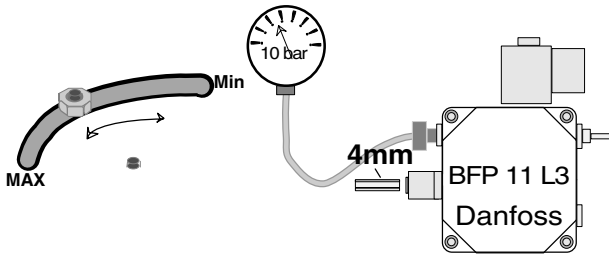


Set the temperature selector at max. 90°C, and the burner will ignite.
Set the oil pressure at 10 bar.
If visible smoke is generated, the air is adjusted upwards until it is smokeless.
Let the machine run for at least 3 minutes.

At inlet temperature 4°C → 12°C, temperature indicator lamp 70°C is to light up.

At inlet temperature 12°C → 20°C, temperature indicator lamp 90°C is to light up.

If the above-mentioned temperatures have not been reached, the oil pressure is adjusted to max. 11 bar. The air is adjusted upwards, so that it is smokeless. If the temperature has not been reached after approx. 1 minute, check chapter D, Performance faults.

Fine adjustment

While the machine runs steadily with max. working pressure and max. 90°C set at temperature control, a test with Bacharach equipment is made according to the instructions.

The results are written down in diagram, combustion test, on the next page.

The temperature selector is set at max. 150°C, and the water flow reduced to minimum. Measure the water quantity, if necessary. See data. Make sure that the top lamp 150°C lights up, and steam hisses out of the nozzle.

COMBUSTION TEST

Unacceptable	Good		Better	Best	
CO_2 %	< 8	< 9	10	11	12
O_2 %	11	8.6	7.2	6	4.5
Soot scale	> 4	> 3	2	1	0
Smoke temp. (t)	> 260	> 240	220	200	180
CO ppm	200	150	100	50	25
Loss %	> 13	> 12	11	10	9

Type no.:	Serial no.:	Date of production:	
Enter the results in the fields		Before rep.	After X
Adjusted by KEW technician:		Date:	
Next visit:		Date:	

TEST EQUIPMENT: _____

Smoke temp (t) = outlet temperature - inlet temperature.
The inlet temperature is measured at the air nozzle in bottom cabinet.

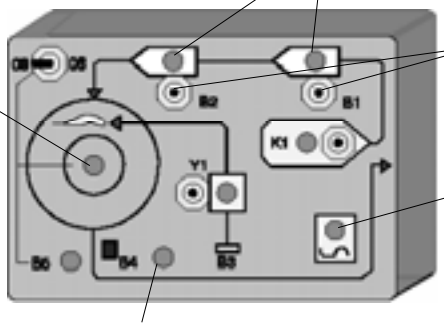
The test box, no. 6420100, is an indispensable tool, especially when the problem is intermittent. Further to the information on this page there is more information in Service/Technical Information no. 56.

The test box is mounted directly in the plug of the PC-board. Access to this is gained by loosening the front plate at shown.

The button at the top left-hand corner is set at 09 (machine with flame sensor). Water is filled into the machine, and hoses are connected. The machine is set at 150C and started.

Flow control lamp shows a green light, when the flow switch gives a signal

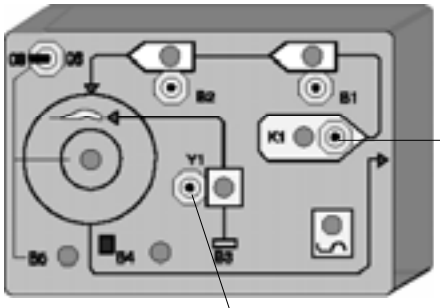
Flame sensor and magnet coil. Light green when they are active (burning)



At failing signal the button in question is pressed, and the flow switch is by-passed

Voltage indicator,
green light - voltage ok
yellow light - voltage low
red light - voltage high

Temperature sensors
green light - they are ok
yellow light - they are short-circuited
red light - they are disconnected

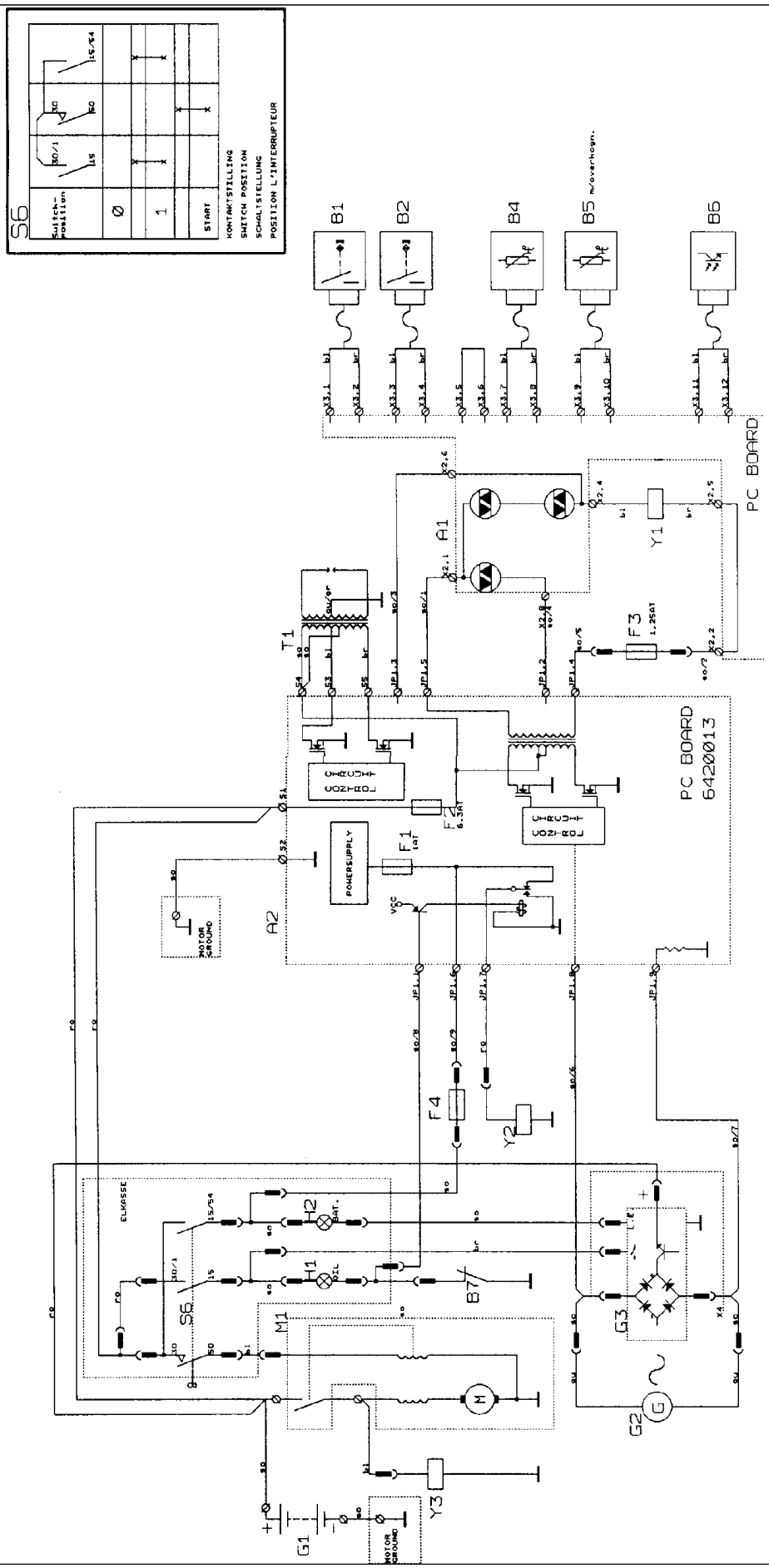


Only to be used on the machine with electric motor

Press the button Y1. Gives a direct signal to the oil spool and by-passes by that the safety system.

NB: When the test box is connected, the flame sensor is disconnected the safety system. The machine is therefore not stopping automatically, although the flame sensor is defect.

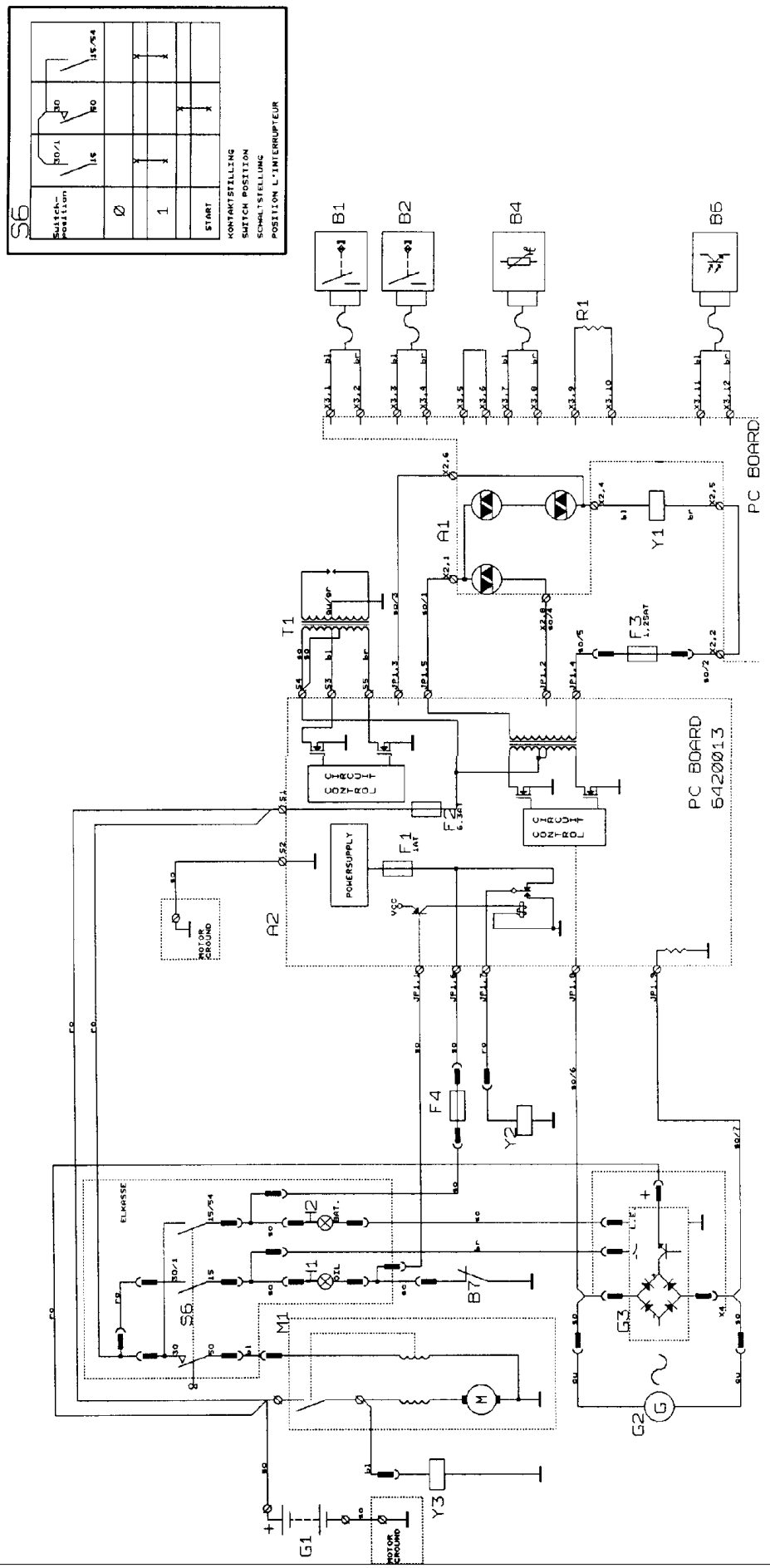
Wiring diagram
Contractor Diesel
No. 6425101bv



A1	KEW control unit, PCB	F1	Fuse (melting)	H1	Oil indicator
A2	12VDC/24VAC converter	F2	Fuse (melting)	H2	Charging indicator
B1	Flowswitch	F3	Fuse (melting)	M1	Starting motor
B2	Flowswitch	F4	Fuse	R1	Ohmic resistance
B4	PT500 temperature sensor	G1	Battery	S1-S5	Terminals (PC-board)
B5	PT500 temperature sensor	G2	Generator	S6	Start switch
B6	Light sensor	G3	Rectifier	T1	Ignition trafo
B7	Motor oil switch				

JP1 - 9 pole plug		br	Brown
X2 - 8 pole plug		bl	Blue
X3 - 12 pole plug		ro	Red
X4 Charging plug		gu	Yellow
Y1 Valve fuel		gr	Green
Y2 Holding coil for oil		As spare part	
Y3 Draw coil for oil			
so Black			

Wiring diagram
Contractor Diesel
No. 6425100b



A1	KEW control unit, PCB	B7	Motor oil switch	G3	Rectifier	T1	Ignition trafo
A2	12VDC/24VAC converter	F1	Fuse (melting)	H1	Oil indicator	JP1	- 9 pole plug
B1	Flowswitch	F2	Fuse (melting)	H2	Charging indicator	X2	- 8 pole plug
B2	Flowswitch	F3	Fuse (melting)	M1	Starting motor	X3	- 12 pole plug
B4	PT500 temperature sensor	F4	Fuse	R1	Ohmic resistance	X4	Charging plug
B5	PT500 temperature sensor	G1	Battery	S1-S5	Terminals (PC-board)	Y1	Valve fuel
B6	Light sensor	G2	Generator	S6	Start switch	Y2	Holding coil for oil
						Y3	Draw coil for oil

so	Black		
br	Brown		
bl	Blue		
ro	Red		
gu	Yellow		
gr	Green		

Spare part proposal

Proposal H

As spare part proposal the below list can be recommended. We furthermore refer to Spare Part Catalogue, Binder no. 7, and Spare Part Catalogue for Contractor.

Sensors:	Flame sensor	no. 6228352
	Temperature sensor	no. 1119011
	Flow sensor	no. 1119010

Pump: (first degree):	Rep.kit by-pass	no. 1118580
	Gasket by-pass	no. 1119568
	Rep.kit valves	no. 1119310
	Rep.kit Heavy-duty	no. 1119195
	Gasket reduced	no. 1119035
	Gasket Heavy-duty	no. 1119571
	Lock washer	no. 6100602
	Rep.kit safety valve	no. 1118512
	(See page 24 in manual)	

Pump:(second degree):	Rep.kit gasket	no. 6109046
	Rep.kit Heavy-duty	no. 1119570
	Roller bearing, 2 pcs.	no. 3200615
	Needle bearing	no. 3200664
	Needle bearing	no. 3200656
	Wobble disc no. 7	no. 6100965
	Wobble disc no. 3, Heavy-duty	no. 6100960
	Bearing track	no. 6100945
	Vibration absorber, 4 pcs.	no. 1801240
	Piston, 4 pcs.	no. 6100901
	Piston, Heavy-duty	no. 6301166
	Lock washer, 4 pcs.	no. 1802529
	(See page 24 in manual)	

Boiler: (first degree):	Oil filter	no. 6184100
	Oil nozzle	no. 2800142
	Kit for oil pump	no. 1119217
	Kit for ignition covers	no. 1119302
	Electrodes, 2 pcs.	no. 6200326

Boiler: (second degree):	Insulation	no. 6240257
	Cord	no. 6200299
	Coupling oil pump	no. 6220404
	Coupling oil pump	no. 3800992
	Bearing for impeller housing	no. 3200680
	Bearing for impeller housing	no. 3201019

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